

April 26, 1956

# The IRON AGE

The National Metalworking Weekly



**How to Get More for Your Welding Dollar P.93**

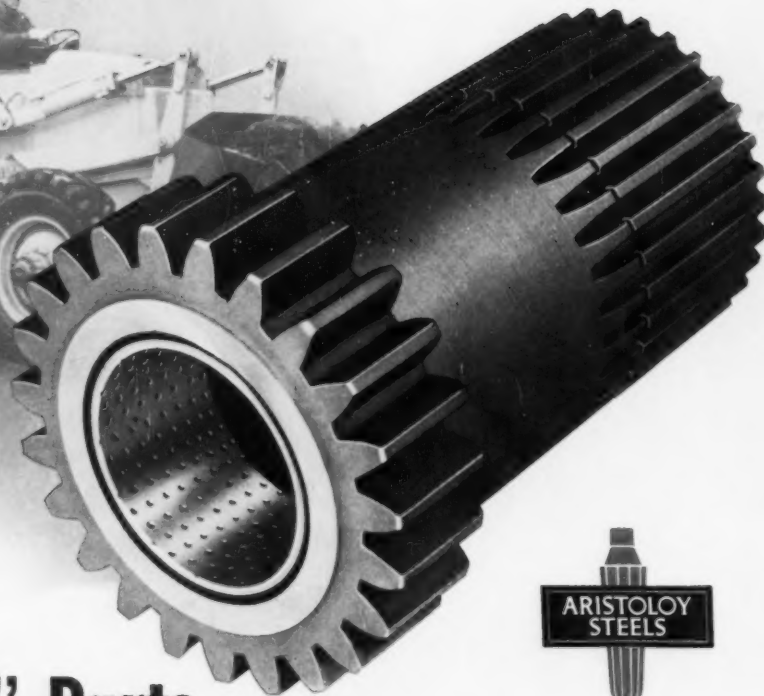
**How Industry Wages War On Noise P.59**

**Steel Expansion Booms Plant Equipment P.55**

**Digest of the Week P-2**



The Frank G. Hough Co., Libertyville, Ill., manufactures "Payloader" tractor-shovels and towing tractors in three types: front-wheel-drive, rear-wheel-drive and four-wheel-drive.



## "Payloader" Parts Produce Production Profit

*... When Made From a*  
**COPPERWELD LEADED ALLOY**

This complex gear assembly is made in six separate operations, or set-ups, with a tooling sequence of 13 machining operations. When the manufacturer switched from unleaded to Copperweld leaded 8620, the faster feeds and speeds gave them a production increase of better than 25%. For example, the surface feet per minute in a finish bore operation increased from 200 SFM to 300 SFM. In addition, tool life increased 60%. Copperweld Leaded Steel, the steel with "built-in productivity" produced profit in this "Payloader" part.



For further details,  
write for free booklet,  
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Thousands of Bethlehem High-Strength Bolts were used to join structural members in framework for new Prudential office building in Jacksonville, Fla. Architects: Kemp, Bunch and Jackson. Contractor: Daniel Construction Company of Alabama. Fabricator and Erector: Ingalls Iron Works Company.

## High-Strength Bolting Speeded Erection of New Office Building in Jacksonville

This handsome building encased in marble, limestone and pink granite is the South-Central headquarters of The Prudential Insurance Company of America, at Jacksonville, Fla. The 22-story structure has a steel framework of 5,893 tons, held together with thousands of Bethlehem High-Strength Bolts. This method of construction saved erection time, as the bolting was completed within a week after the last piece of steel was set.

High-strength bolting is rapidly increasing in popularity as a means of erecting steelwork economically. Bolted

joints are made rapidly. The bolts, used with hardened washers, can be installed in seconds. A holding wrench grasps the bolt-head, and the nut is driven to predetermined tension with a calibrated pneumatic impact wrench. That's all there is to it! There's no fire hazard involved. Besides, the bolting operation is less noisy than riveting, making it more suitable for use in hospital and school zones.

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ing and tempering, and meet every requirement of ASTM Specification A-325.

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*On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation*



# BETHLEHEM STEEL

April 26, 1956—Vol. 177, No. 17

# The IRON AGE

## Digest of the Week in Metal Working

Starred items are digested at right.

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Chestnut and 56th Sts. Philadelphia 39, Pa.

### NEWS DEVELOPMENTS

#### STEEL EXPANSION MEANS BOOM TO SUPPLIERS P. 55

Equipment to make 15 million more tons of steel creates boom for steel mill suppliers. Backlogs lengthen,



but situation is not out of hand. Suppliers are making plans for extended good market as mills smooth out unbalanced steel making and finishing capacities for future production.

#### HOW INDUSTRY CUTS ITS NOISE PROBLEM P. 59

Research in several directions is being launched against industrial noise. Mounting damage bill from hearing impairment brings issue to point. State laws provide serious penalties.

#### WESTINGHOUSE LOCKOUT CHARGE IS HIT P. 60

Pennsylvania companies join in fight against state's decision in Westinghouse strike. Millions in unemployment compensation is at stake. Ruling states that strike became a lockout after company rejected governor's plea for binding arbitration.

#### NEW USES BOOST METAL POWDER INDUSTRY P. 62

A good year for metal powder industry is ahead in spite of dropoff in demand from auto markets. Biggest new field is in high density materials. Bulk of market continues to be in iron powder. Some firms now use as many as 500 powder parts.



ARC-WELDING, in this case of magnesium, accounts for large proportion of all weld-joining done today. Special 'Welding Dollar' feature, summarized below, appears on P. 93. Dow Chemical Co. photo.

## DOES FREE PISTON ENGINE HAVE FUTURE?

P. 72

GM's new unit starts speculation that it may be successor to reciprocating engine. It has advantage over gas turbine in that it does not require strategic metals. Present auto engines may have reached the point of diminishing returns on improvements, despite recent gains.

## SPECIAL FEATURES

### HOW TO GET MORE FOR YOUR WELDING DOLLAR

P. 93

This special feature, third in the 'Metalworking Dollar' series, covers all eight major welding categories; breaks each down further by individual processes. Selection of welding processes for various materials, reasons for selection, pros and cons of each process—they're all defined. Practical tips on using each process to best advantage are also given.

### IRON AGE WELDING ROD AND ELECTRODE CHARTS

P. 96

A major part of the welding feature, these charts—brought up to date from their previous publication in December '53—show you: (1) comparable metal arcwelding electrodes, showing what's needed for various specifications and who makes the electrodes, and (2) rods, and producers of rods, for processes other than metal arc welding.

### ALLOY STEELS EXTEND MACHINE TOOL LIFE

P. 101

Traditionally, most machine tools are built for a long service life. Today they need rugged component parts to stand up to demands for ever-faster cutting speeds, more horsepower. Warner & Swasey uses nickel alloy steels for highly-stressed turret lathe components. Three grades cover all requirements, keep inventories, costs down.

### GIANT STRESS RELIEVING JACKET HUGS HEAT

P. 104

Proper stress relief plays a big part in getting long service life out of some types of large field-fabricated structures. With vessels, its done by making them serve as temporary furnaces. But how prevent excessive heat loss? In this recent job, four 75-ft coke drums were taken in sequence, jacketed with insulation, stress-relieved. Same jacket sufficed for entire job.

### CHEMISTS PROBE SHOP'S METALWORKING PUZZLERS

P. 106

Know where your metal processing savings lie? The chemist can tell you where much of your unnecessary expense is going, and how you can avoid it. The chemical lab, working closely with the plant on production problems, more than pays its freight. It helps product quality, plant efficiency.

## MARKETS AND PRICES

### WHAT'S BEHIND STEEL SCRAP PRICE RISE

P. 57

High steel production for one, and effects of inflation for another. But scrap exports are a third fly in the ointment, and record-breaking prices are creating unrest among consumers over heavy export shipments.

### WHY PLANNED INDUSTRIAL SITES INCREASE

P. 58

They are easing many of industry's growing pains in more than 130 areas of the country. They offer planned services, eliminate many of the conflicts that often accompany expansion plans of industry. Railroads are biggest factor.

### TWO SIDES TO THE ZINC MARKETS PICTURE

P. 61

G. H. LeFevre, vice president of U.S. Smelting, Refining and Mining Co., told annual American Zinc Institute meeting that while 1955 consumption and slab production was record high, there is still lots to be concerned about with regard to mining output.

### IS NICKEL DISTRIBUTION FAIR TO ALL?

P. 77

Suspicion is growing in Washington that small firms may be getting the short end of nickel distribution system. Congress and Justice Dept. both show interest. Issue may mean serious trouble to ODM.

### STEEL DEMAND CARRIES STRONG PUNCH

P. 51

Despite an easier tone in hot and cold-rolled sheets, steel demand continues to run strong. Incoming orders are 20 to 35 pct ahead of shipments. Inventory-building and construction are major factors.

## NEXT WEEK:

### VACATIONS: REDUCED OPERATIONS OR PLANT SHUTDOWN?

Summer's approach poses old problem. Dartnell all-industry sample survey of 225 firms finds majority sticking with last year's arrangements; 16 pct liberalizing policies. Forty-two pct will close down. Labor uncertainty clouds steel picture.



# SALT BATH HEAT TREATING Cuts Production Costs!



## TYPICAL!

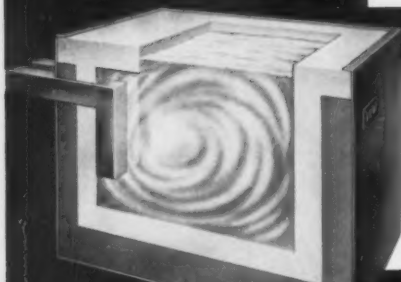
Rejects due to distortion were cut 85% by hardening this clutch lever in Ajax salt baths. Uniform hardness was easily obtained.

## 1 Parts don't warp out of shape

Distortion of parts is *always* materially less in salt baths than in any other heat treating method because of "automatic preheat," uniform conduction heating of all surfaces regardless of size, ease of fixturing, and the natural buoyancy of molten salt. Most grinding can be completed before parts are hardened.

## 2 Parts get complete surface protection

No atmosphere problems exist since all air is "sealed out" by the molten salt. Even when transferred from one bath to another, a film of molten salt clings to parts, protects them fully to the instant of quenching. Scale and decarb are avoided.



## 3 Parts heated uniformly throughout

Internal heating by closely-spaced electrodes creates an automatic, electrodynamic stirring action that keeps heat uniform in *all parts of the bath*. Heat treating results are remarkably consistent.

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# Two Ways Armco ZINCGRIP Steel Tubing May Help You Cut Costs, Build Sales



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## Long Product Life

The mill-applied, hot-dipped zinc coating, on inner and outer walls of the tubing, is assurance of extra durability for your products . . . more satisfied customers. And the smooth, attractive finish of ZINCGRIP Tubing can give your products another powerful selling point.

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With ZINCGRIP Steel Tubing you can take full advantage of the weight reductions possible with rigid tubular construction. Easy-to-fabricate, lighter-weight products can save you money and help boost sales.

You can bend, join, flange, upset or bead Armco ZINCGRIP Tubing on standard equipment. The special zinc coating *stays on* . . . doesn't flake or peel in fabricating operations.

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Manufacturers of conveyor rolls, farm equipment, lawn mowers and sweepers, TV antennas and scores of other products are making profitable use of Armco ZINCGRIP Steel Tubing. Why not consider its advantages for the products *you* make or use?

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and the Engineering Index.



## It Isn't Necessarily So!

♦ **EVERYONE HOPES** — and many people assume — that the recent move of the Federal Reserve Board will be successful. The latest boost in the discount rate on loans to member banks is the fifth such action in the past year.

The theory is that by making it costlier to get a loan there will be less borrowing and perhaps a check on inflation. Federal Reserve people have been worried privately about the increase in debt for some time. These sudden increases in the discount rate are the combined result of the Board's anxieties.

Since the "Fed" isn't — and never should be — what we would call sacred, let's look at the other side of the picture. We can recall that all the discount rate raises did not check inflation nor did they affect borrowing.

It takes a lot of money to keep the economy going. Marginal borrowing may be discouraged, but the Board's move also makes it more expensive for the regular everyday businessman to carry on.

Take the case of the small businessman who usually has a tough time in any period; he has to pay more now to carry what he considers is a proper inventory loan. Also, he must pay more when he borrows for legitimate needs.

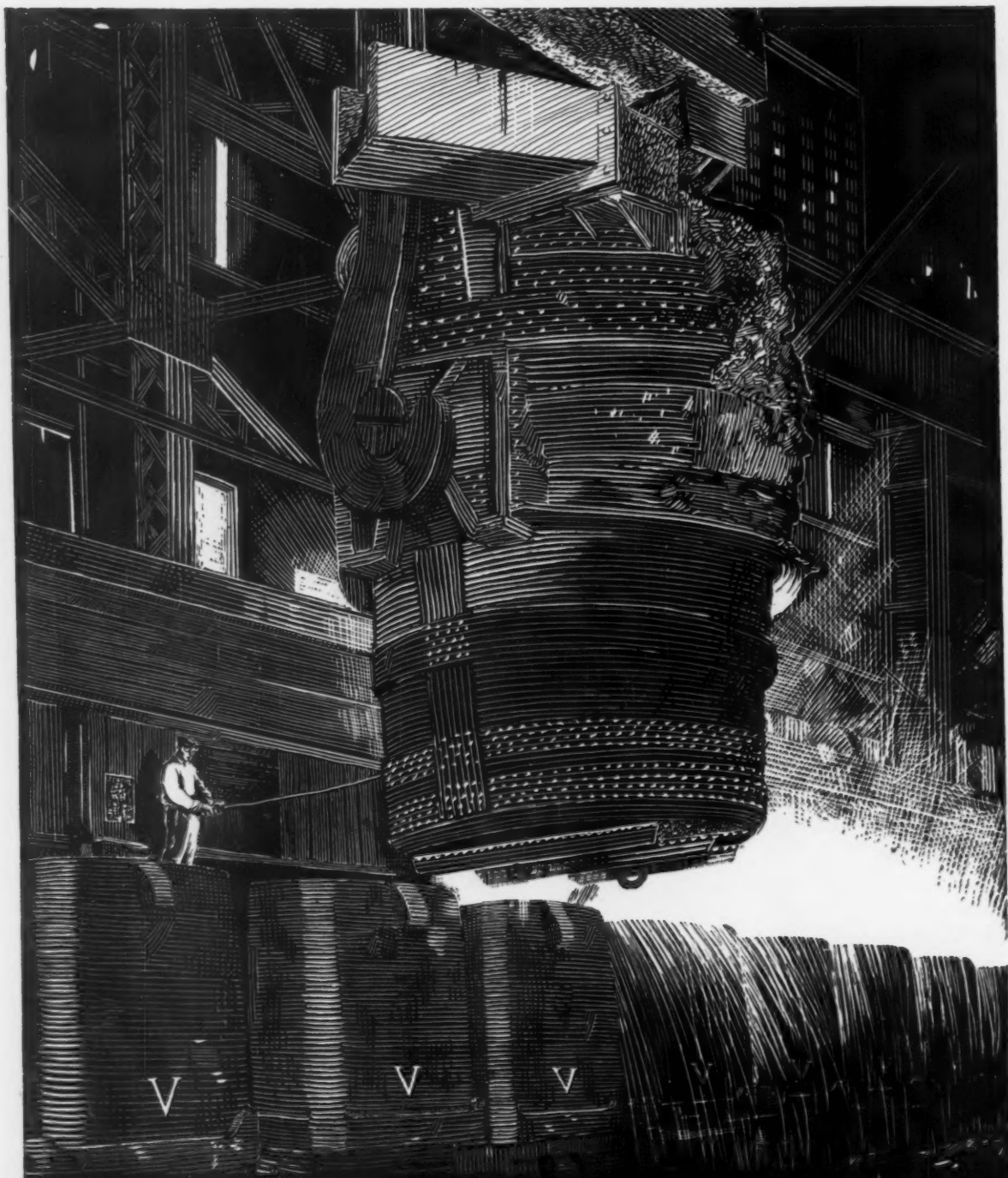
At present we are in one of the biggest industrial expansion periods in history. Every major business, it seems, is expanding in order to make more products, eliminate shortages and supply what the trade wants — or thinks it needs. This expansion in various industrial areas is increasing capacity — a move that in itself is essentially anti-inflationary.

But all these businesses — large and small — must now pay more for expansion money. And those who use their credit to buy things that keep industry going will also pay more because of the Board's action.

The point here: it isn't necessarily true that what the Board is doing will have the effect it hopes to get. It is entirely possible that these increased rates will produce nothing more than higher cost money for those who must expand and carry on their businesses.

*Tom Campbell*

EDITOR-IN-CHIEF



# VALLEY MOULD AND IRON CORP.

General Offices: HUBBARD, OHIO

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dear editor:

letters from readers

Report to Management

Sir:

Congratulations for your splendid report entitled "Report to Management," appearing in your April 5, 1956, issue of IRON AGE, page 73.

For the past few years you have complimented us with additional copies of this most complete report. Will you please provide us with 25 copies at your convenience? *R. A. Redard, Purchasing Agent, Keystone Steel & Wire Co., Peoria, Ill.*

Plant Gambling

Sir:

I should like to obtain permission to reprint an article appearing in the March 22, 1956, issue of THE IRON AGE entitled "Special Report: Plant Gambling: You Can't Beat the Odds" on pages 35 and 36. *J. E. Frederickson, Director, Plant Protection Activities, General Motors Corp., Detroit, Mich.*

Permission granted.—Ed.

CO<sub>2</sub> Cores

Sir:

I note with a great deal of interest your April 12 article on CO<sub>2</sub> cores.

We have been playing with this for several weeks and are having very good experience in our steel foundry. We find that the cores are very good, give us good castings with less scabbing or washing, give a good casting surface and are less costly to make.

We are having one serious trouble and we note that you seem to have the answer. We cannot blow them through our core blower. As soon as we turn the air blast on, the sand sets up pretty hard

and will not go through the blower plate. We have actually had to chisel the sand out as the air seemed to set the core almost as hard as the carbon dioxide. Our sand consisted only of silica sand and silicate of soda, mulled in a Simpson muller.



Curing cores with CO<sub>2</sub>

Our hand made cores are fine, but can you tell us why we cannot blow them? Any information will be very much appreciated. *C. P. Caldwell, President, Caldwell Foundry & Machine Co., Inc., Birmingham, Ala.*

Your problem seems to indicate a lack of adequate lubricity.

The sand mix [See April 12 article, p. 98] used at Gamon Meter Div. was the result of considerable experimentation. It gives excellent results on mechanically rammed cores. Elimination of "sticking" has been accomplished by the special additions mentioned.—Ed.

Tube-In-Strip

Sir:

In the March 29 issue of THE IRON AGE magazine, you listed an article "Tube - In - Strip—Bonanza for Product Designers." Would it be possible for you to furnish me with a reprint of this article? *B. Kenneth Lees, Purchase Analyst, Central Purchasing Staff, Carrier Corp., Syracuse, N. Y.*

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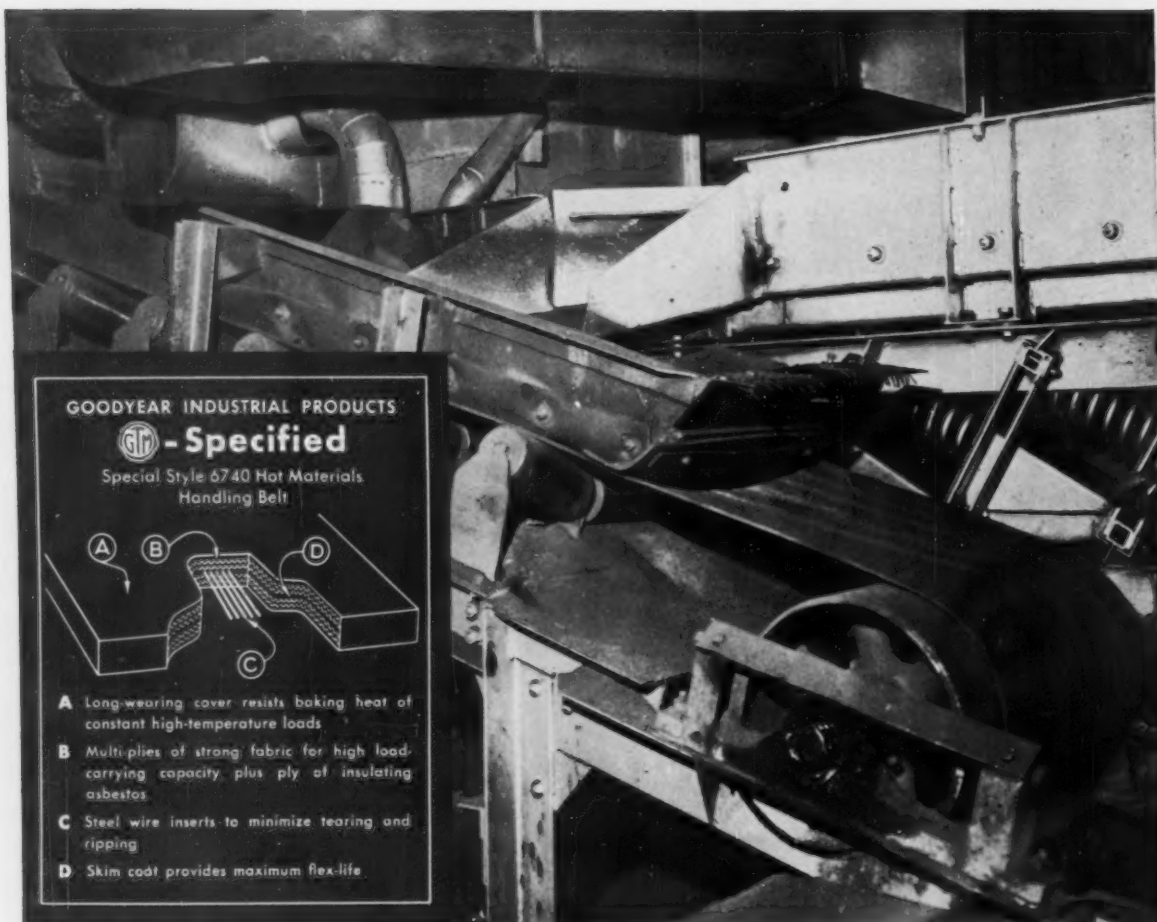
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## G.T.M. Saves \$4000/year on shake-out refuse belts

**S**HARP, hot shot, gates, risers and other scrap quickly tore and burned up refuse-handling belts at this automotive foundry. On the average, the 126' belts only lasted two months. Usually large patches had to be put in the belt to get even two months' service.

Special, wire-inserted belts (see blueprint) and vulcanized, rather than steel-plate, splices

were suggested by the G.T.M.—Goodyear Technical Man. Result: *Service averages six months with \$4000 annual savings.*

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## fatigue cracks

by William M. Coffey

### Steel Labor

Last week's issue brought you a factual report on the men who'll sit (literally or figuratively) behind the union side of the table at upcoming steel wage talks. So factual, in fact, that a man who'll be on management's side phoned the day the issue came out. A key steel company official, he wanted 50 copies mailed at once. In the works for the past few weeks and due soon is "Inside U. S. Steel"—a report on the men and the issues on management's side.

### Much Too Strong

Wire is a wonderful thing but sometimes it can be too strong. Or more exacting, choosing wire too strong for the job can raise merry ned with the customer. Now most airline luggage tickets are slipped on with string; when you change planes it's no trick to yank 'em off. Not so with one hotel in Los Angeles (where everything is done in a big way). They use wire. Result, says editor George Sullivan, who just returned from a West Coast trip, is murder. A burly airlines porter seized the wired-on tag on his two-suit and pulled. The wire held but the top ripped off the bag. Conclusion: We're recommending a reduction in diameter and plan to follow with a bill for a new suitcase.

### Back Issues for Free

The premium on space in company libraries is pushing the trend to microfilm. So, more and more our friends write in to offer back issues of your f.f.j., bound and ready to put on the shelves of libraries that have some space to spare.

Right now, the first reader to write or wire may have — for the cost of the collect freight from the East — a set of bound volumes of THE IRON AGE for 1914-1929.

And, by the way, did you know that microfilmed copies of THE IRON AGE are available on a current basis from University Microfilms, Ann Arbor, Mich.?

### Time Capsule

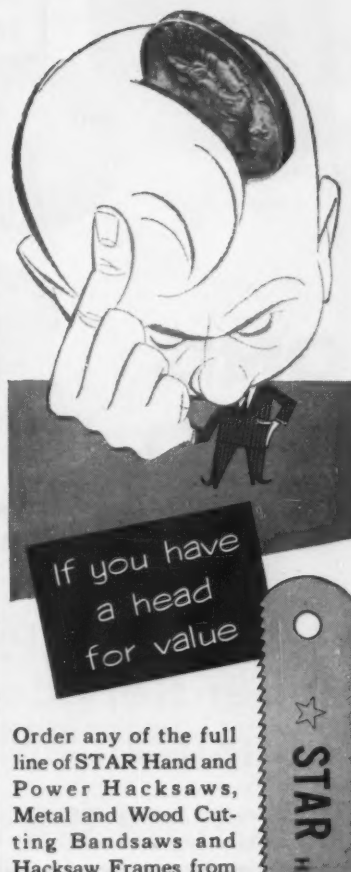
Ageless is the word for your f.f.j. From readers R. C. Peterson (Kaiser Aluminum) and I. H. Stauffer (Stauffer-Eshleman) in Louisiana we have newspaper clips to prove it. Among items in a time capsule discovered in the Grand Army of the Republic Monument in Chalmette (La.) National Cemetery was a copy of the April 9 issue of THE IRON AGE. Fact is, it pops up all over the place. And will pop up again if they ever open the time capsule in Socony-Vacuum's new stainless steel building in New York.



Socony Vacuum Tie-in

### New Capsule

Incidentally, tie designer Bronzini has come up with a new design based on the stainless panel design on the building's exterior. (See cut.) We don't have one.



Order any of the full line of STAR Hand and Power Hacksaws, Metal and Wood Cutting Bandsaws and Hack saw Frames from your Industrial Distributor.

Industry prefers STAR quality, prefers the blades made of carefully heat-treated, top-quality steel, fabricated on specially designed equipment — because STAR consistently delivers fast, economical metal cutting and long blade life.

Be sure to ask your Industrial Distributor for STAR "Moly" High Speed Steel Blades. STAR developed this high speed, heavily-alloyed steel blade of molybdenum. Remember, "Moly" High Speed blades outlast standard steel blades 10 to 1, cut as well as the best high speed steel blades made, but are substantially lower in cost.

**FREE!** Ask your Industrial Distributor for a supply of our NEW Metal Cutting Booklets and Wall Charts.

1887



Sold Only Through Recognized Distributors

**CLEMSON BROS., Inc.**  
MIDDLETOWN, N. Y., U. S. A.

Makers of Hand and Power Hack saw Blades, Frames, Metal & Wood Cutting Band Saw Blades and Clemson Lawn Mowers.

Square locked  
head maintains  
**ACCURATE**  
alignment

Box section arm fully  
encloses driving shaft

100%  
Anti-friction  
bearings

Head  
in perfect  
balance on  
arm

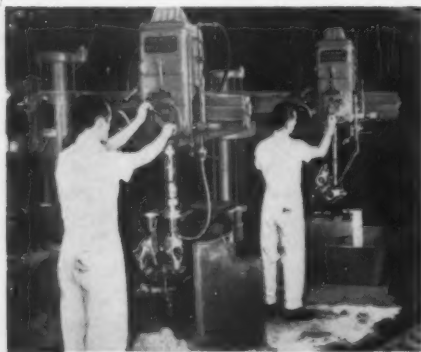
# LONG LIVED ACCURACY

in this high speed  
**Super Service  
Radial**



Arm  
swings with  
finger tip  
ease

No driving  
clutches



Drilling, Core Drilling and Reaming Alloy Steel Cheek and Counterweights of Aircraft Engine Crankshafts. Reamed holes are held accurate within .0005".

3 and 4 foot arm.

Spindle speeds up to 3500 r.p.m.  
without belts.

This simplified, very versatile, speedy, accurate and durable machine is rigid and easy to handle.

A distinctive feature is the elimination of spindle driving clutches as forward and reverse rotation is thru a reversing motor . . . very fast for tapping work.

Furnished with 9" column with 3' or 4' arm and 3 HP driving motor.

Get the details. In their range, these machines are most economical and productive.

Write for Bulletin R-21C.

**CINCINNATI  
BICKFORD**



RADIAL AND UPRIGHT DRILLING MACHINES

**CINCINNATI BICKFORD DIVISION**

GIDDINGS & LEWIS MACHINE TOOL COMPANY

OAKLEY, CINCINNATI 9, OHIO, U.S.A.

## dates to remember

### APRIL

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Conference, April 30-May 1, 1956, Hotel William Penn, Pittsburgh. Society headquarters, 29 W. 39th St., New York.

### MAY

NON-FERROUS FOUNDERS' SOCIETY—Annual meeting, May 3, Marlborough-Blenheim, Atlantic City, N. J. Society headquarters, 192 N. Clark St., Chicago.

### EXPOSITIONS

AMERICAN FOUNDRYMEN'S SOCIETY—May 3-9, Atlantic City, N. J.

AMERICAN WELDING SOCIETY—May 7-11, Buffalo, N. Y.

MATERIALS HANDLING SHOW, June 5-8, Cleveland.

ASSN. OF IRON & STEEL ENGINEERS, Sept. 25-28, Cleveland.

METAL SHOW—Oct. 8-12, Cleveland.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS—1956 Pacific Northwest regional conference, May 3-5, Olympic Hotel, Seattle. Society headquarters, 29 W. 39th St., New York.

AMERICAN WELDING SOCIETY—National spring meeting, May 7-11, Hotel Statler, Buffalo, N. Y. Society headquarters, 33 W. 39th St., New York.

THE NATIONAL ASSN. OF SHEET METAL DISTRIBUTORS—46th spring meeting, May 14-15, Hotel Roosevelt, Pittsburgh. Assn. headquarters, 1900 Arch St., Philadelphia.

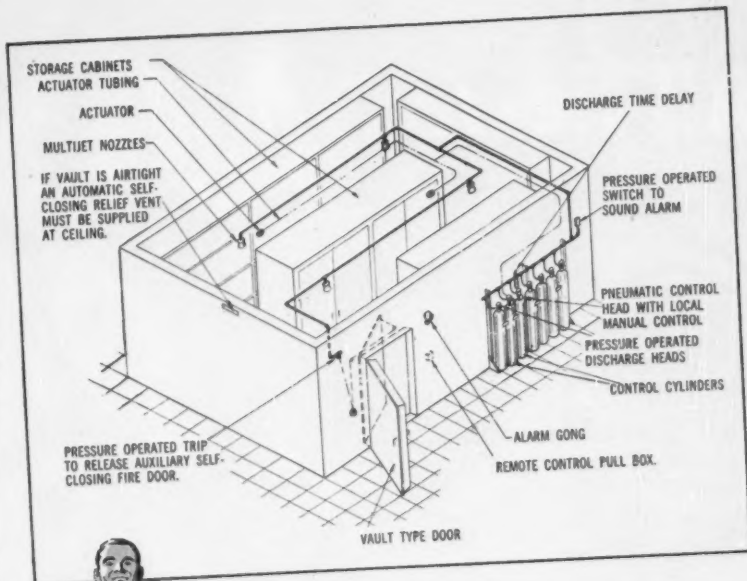
NATIONAL ASSN. OF WASTE MATERIAL DEALERS, INC.—Spring meeting, May 16, The Sheraton-Astor Hotel, N. Y. Society headquarters, 271 Madison Ave., N. Y.

PORCELAIN ENAMEL INSTITUTE—Midyear divisional conference, May 16-17, Edgewater Beach Hotel, Chicago. Society headquarters, 1346 Connecticut Ave., N.W., Washington 6, D. C.

AMERICAN SUPPLY & MACHINERY MANUFACTURERS ASSN.—Annual convention, May 20-23, Atlantic City, N. J. Society headquarters, 2130 Keith Bldg., Cleveland.

WIRE REINFORCEMENT INSTITUTE—Annual spring meeting, May 28-30, The Greenbrier, White Sulphur Springs, W. Va. Society headquarters, National Press Bldg., Washington 4, D. C.

CONCRETE REINFORCING STEEL INSTITUTE—Annual meeting, May 28-June 2, The Greenbrier, White Sulphur Springs, W. Va. Institute headquarters, 39 S. Dearborn St., Chicago.



## GUARD VALUABLE RECORDS WITH THIS ENGINEERED FIRE PROTECTION!

Just let fire destroy one irreplaceable set of records—or original drawings—and your business stands a good chance of bankruptcy! And keep in mind that 44% of the firms whose doors are closed by fire *never* reopen for business again!

It's easy to see, therefore, why farsighted business executives insist on Kidde fire protection to safeguard their business records. Kidde systems—like the record vault installation shown above—are tailor-made to *fully* protect the many different kinds of hazards you'll find in industry today.

With a Kidde system on the job, fire is out almost as soon as it starts. Kidde rate-of-temperature-rise detectors trigger the system

at the first sign of a blaze, guarantee you round-the-clock protection even in case of outside power failure. Using safe, efficient carbon dioxide gas, Kidde systems snuff fire *without* a mess, will *not* damage records, papers or drawings!

Kidde systems have no falling weights, use no clumsy mechanical triggering methods. Pneumatic Control Heads insure instant and complete CO<sub>2</sub> discharge. All moving parts of a Kidde system are self-enclosed for safety, need no replacement after a fire, have easy-to-read indicators which show whether system is "set" or "released."

It's easy to get the best in fire protection—and it *can* mean the difference between profit and loss for you. For more information, write Kidde today.

# Kidde

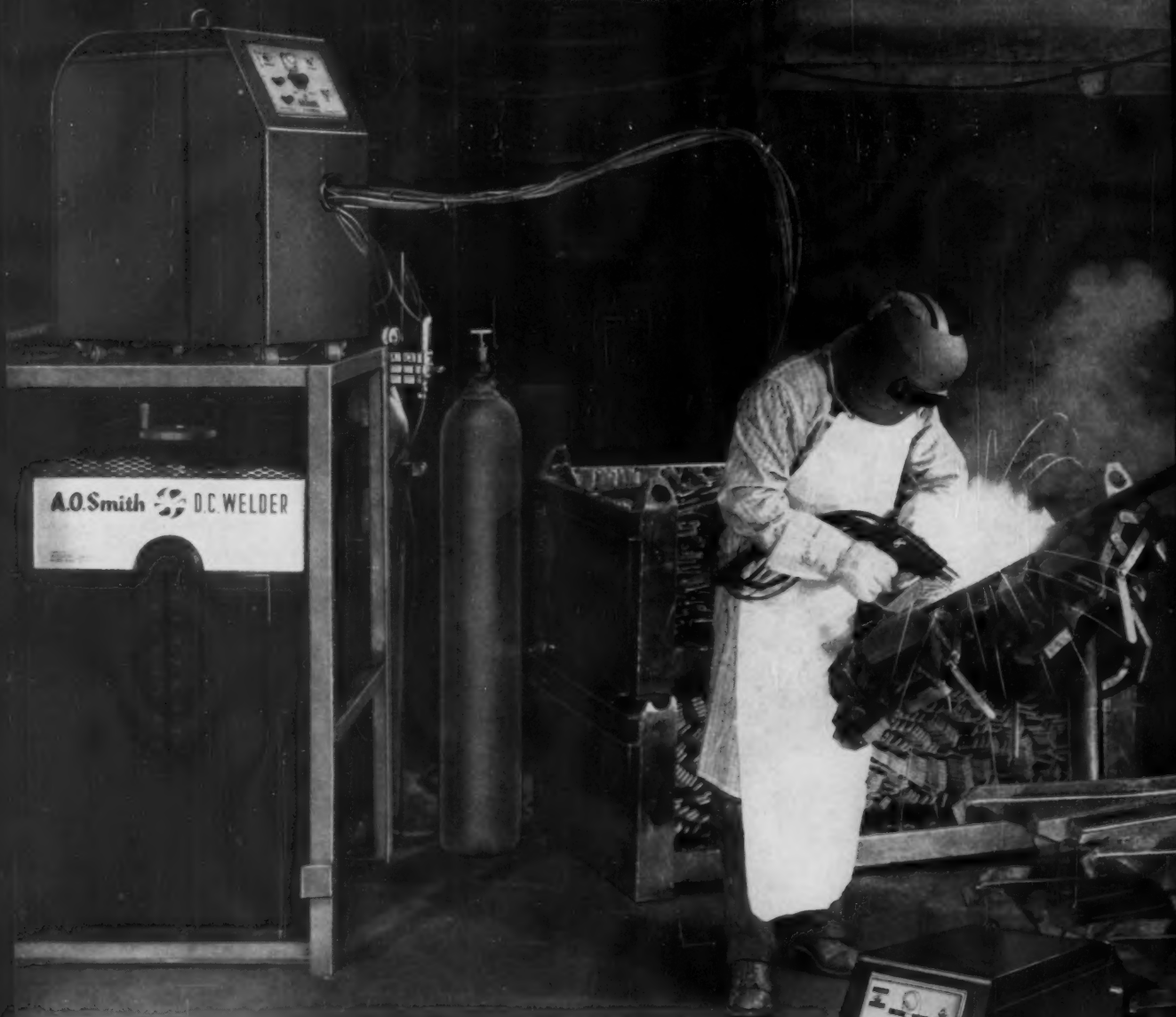


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**Walter Kidde & Company, Inc.**  
449 Main St., Belleville 9, N. J.

Walter Kidde & Company of Canada, Ltd.  
Montreal—Toronto

# All New... A.O. Smith



## NEW FEATHERWEIGHT HAND GUN

... is as easy to use as pointing your finger. Water-cooled, it has no "O" rings ... eliminates leakage. Ends necessity for complicated switchovers when changing wire sizes. All connections are fully protected Streamline design increases visibility.



# C-OMANUAL

## Carbon Dioxide Hand Gun Welding

**...offers amazing economy and high degree of automation!**

★ **Cuts gas cost to practically nothing!**

1¢ per cubic foot for carbon dioxide as compared to almost 7¢ for Helium and 9¢ for Argon... and you use much less. Savings in gas alone will more than pay for your C-OMANUAL unit in several months.

★ **Clean slag-free welds!**

No flux to clean, no chipping, no scraping.

★ **Fast, fast, fast!**

Several times faster than the fastest stick electrodes... as fast, or faster than any semi-automatic process in existence.

★ **Visible arc**

Keeps you in the groove... assures consistent weld quality. Speeds spotting of nozzle.

★ **New simplicity of operation**

There's no constant fiddling with settings. Console automatically controls arc length... compensates for operator's arc distance variations.

★ **Deeper penetration**

Assures sound, uniform welds with excellent strength and ductility.

**SEEING IS BELIEVING** — Try C-OMANUAL yourself at the AWS Show, A. O. Smith Booth No. 90. For complete facts and information on availability, contact your man from A. O. Smith.

### COMPACT, EASILY PORTABLE CONTROL CONSOLE

Mounted on free-rolling rubber casters, the control console is easy to move from spot to spot. It contains wire reel, feed and speed controls, easily traced electrical circuits and all gas and water connections — plus the exclusive two-speed head which allows operator to get proper feeds for light or heavy wire by mere flick of selector switch. Controls on front panel are conveniently grouped, easy to read.

Through research  ... a better way

**A.O. Smith**  
CORPORATION

**WELDING PRODUCTS DIVISION**  
Milwaukee 1, Wisconsin  
INTERNATIONAL DIVISION: Milwaukee 1, Wis.



## COPPER gives you more to talk about

Are you in a business whose product needs constant selling? Most products do.

Perhaps yours must be sold to many people . . . your own sales organization . . . distributors, retailers, consumers.

Copper gives you more to say for your product.

And especially where you're selling against competition, *copper can make the difference.*

For no substitute possesses the combination of characteristics you get . . . and offer . . . in copper and its many versatile alloys.

Today, as always, the phrase "made with copper" signifies *quality*.

That's because people's experience with copper is favorable. There is no doubt about copper's performance.

If mere acceptance isn't enough for your product . . . if competition makes *preference* important . . . give yourself the advantage of copper or one of its many alloys.

You will find that COPPER gives you more to talk about—*helps you sell!*

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### COPPER OR ITS ALLOYS PROVIDE THESE ADVANTAGES:

Best conductor of electricity commercially available



Does not rust . . . high corrosion resistance



Best heat transfer agent of all commercial metals



Easy to machine, form, draw, stamp, polish, plate, etc.



Welds readily . . . excellent for soldering and brazing



# WESTINGHOUSE SAVES \$18,043 with USS "T-1" STEEL

The Sunnyvale, California, plant of Westinghouse Electric Corporation builds unusual expansion bellows and huge wind tunnel air compressors. Steel bellows that flex, both up-and-down and sideways, form a means of effectively accommodating large thermal expansions between the compressor and the foundation. Westinghouse lopped an impressive \$18,043 off the cost of these bellows by switching to USS "T-1" Steel.

"T-1" costs less to machine. It costs less to weld. To top it off, "T-1"

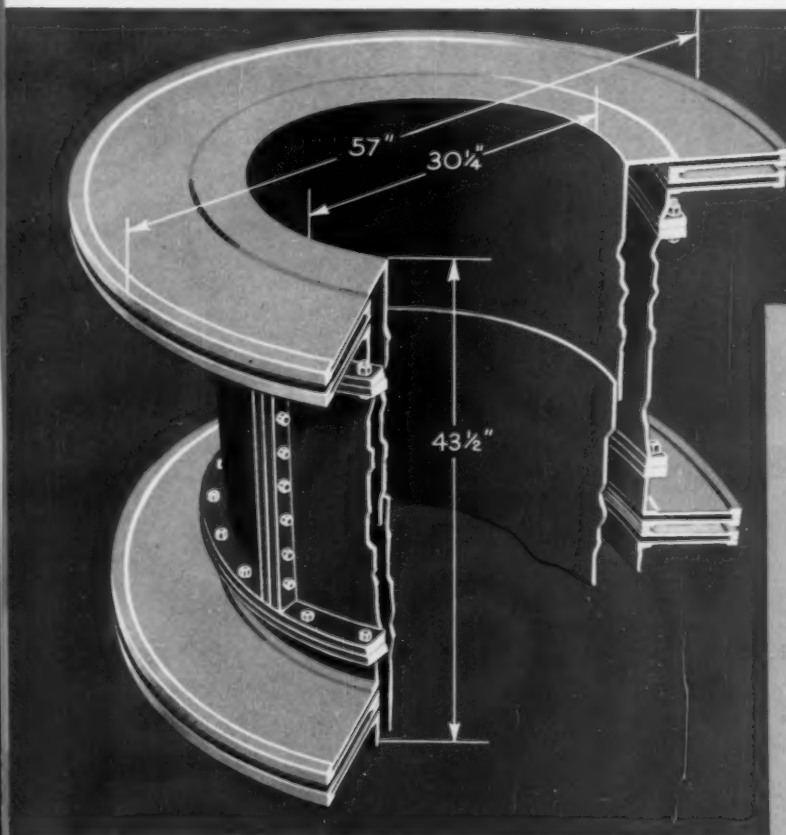
*costs less to buy* than the steel previously used. Yet it is plenty tough and strong enough to meet the rugged physical requirements.

## NEW WAYS TO SAVE MONEY

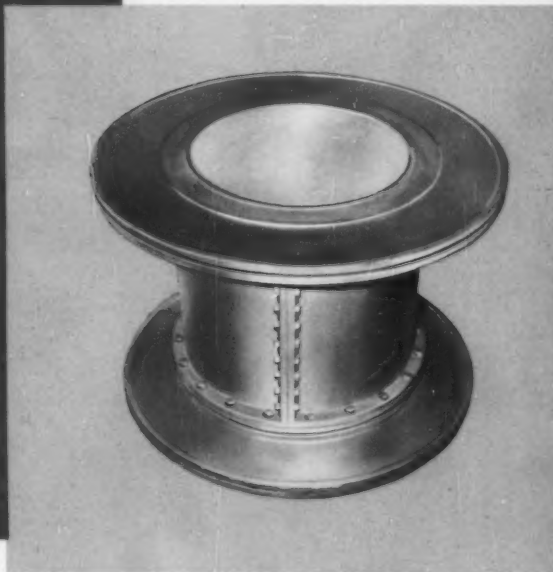
No other alloy steel can be used in *so many ways* to save money or improve products. Already—and "T-1" is still a relatively new steel—it has been used with great success in rotating machines, earth-moving equipment, towers, pressure vessels, mining machines, printing presses, and

other heavy-duty applications.

Think of USS "T-1" when you need very high tensile strength (105,000 psi.) and yield strength (90,000 psi.) . . . when you need good creep rupture strength at high temperatures . . . extraordinary toughness at sub-zero temperatures . . . resistance to abrasion, impact, and abuse. All or any of these properties, plus good weldability, are yours in "T-1"! For information write to United States Steel, Room 5299, Pittsburgh 30, Pa.



**A CUSHION OF STEEL.** Here is one of the bellow systems that are used on large wind tunnel air compressors. Two steel bellows at the top and at the bottom of the central cylindrical section flex, both up-and-down and sideways, to provide a means of accommodating large thermal expansions for the huge compressors. Tough, strong steel was needed for the bellows. USS "T-1" does the job better and, at the same time, saves money for the Westinghouse Electric Corporation.



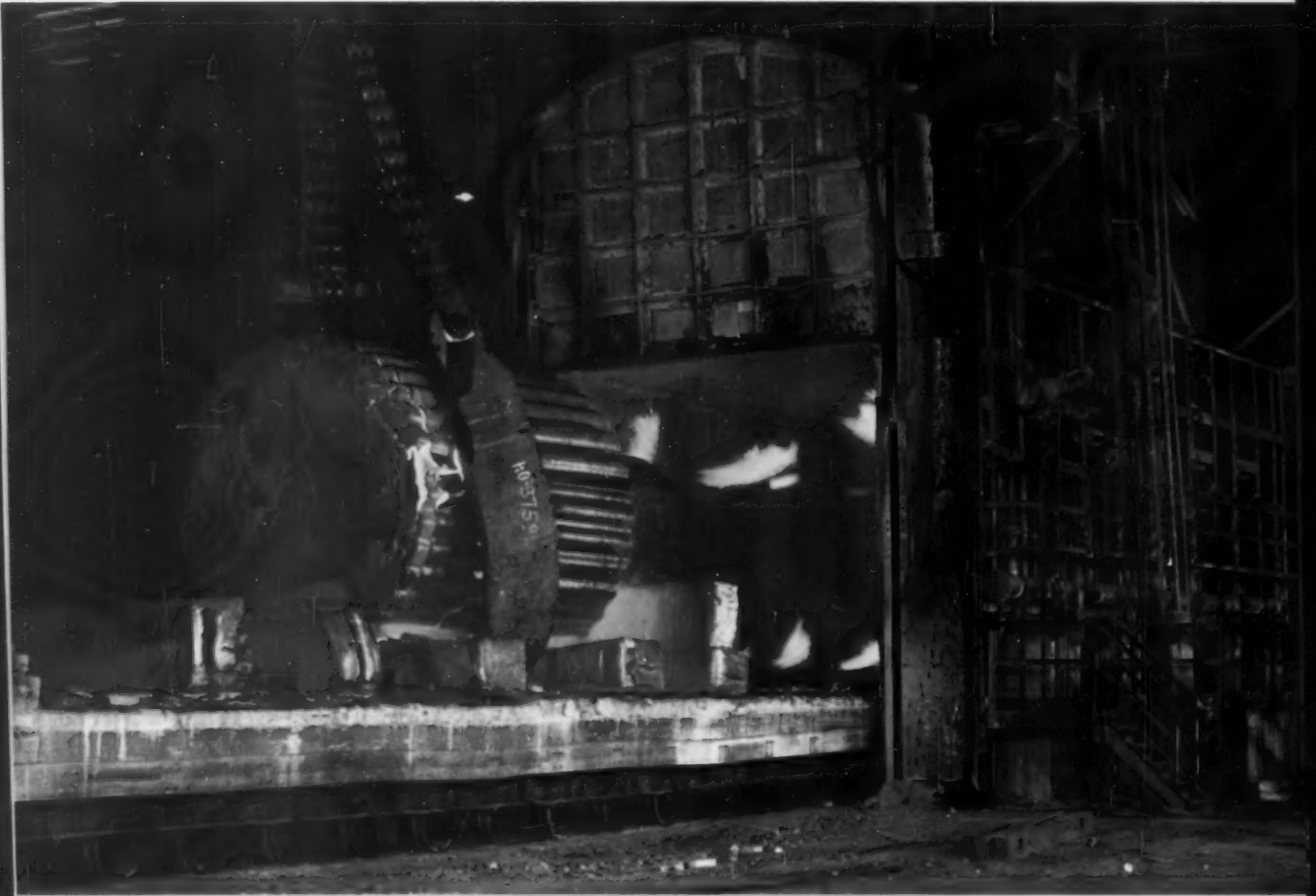
UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.  
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS **T-1** CONSTRUCTIONAL ALLOY STEEL



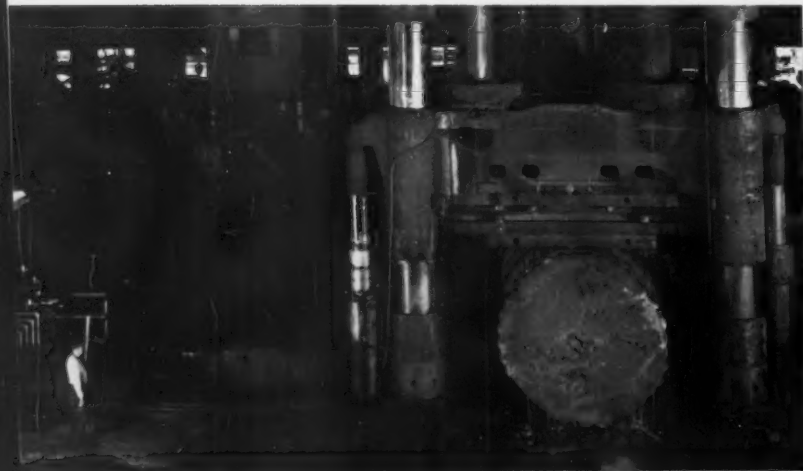
UNITED STATES STEEL

# "I think forging is an art"

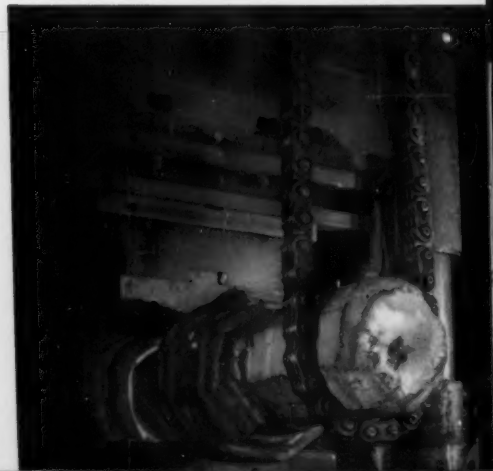


After about three days of heating, crane takes hot ingot to press.

Preliminary forging.  
Basic shape of forging is determined here.



Secondary forging.  
This is water wheel shaft for hydro-electric plant.





says **William C. Steele**

*U. S. Steel Superintendent of Forging and Heat Treating*

Forging an ingot is somewhat like sculpturing a statue by means of semaphore signals that you give to a lurching robot. Using only hand instructions, the forge shop pressman must blend the action of giant cranes, manipulator machines and the press itself. Working only with the immense, blunt dies of the press, he must knead the steel to develop its maximum strength, then squeeze it into the most intricate shapes, frequently to a quarter-inch tolerance.

Truly, this is an Art.

At our Homestead Forgings Division, William Steele has complete charge of the production floor where USS Quality Forgings are forged and heat treated. He has worked in the

Division for 28 consecutive years, producing such things as special armor plate, compound-curved wind tunnel parts, hollow sleeves, precision rolls and machinery parts so complicated that you'd never believe they could be forged from a monstrous ingot of solid steel.

If there is any secret to USS Quality Forgings, it lies in our combination of superior steel quality, the finest processing equipment, and most important: skillful, completely reliable men like William Steele.

Please address inquiries or requests for our free 32-page booklet on USS Quality Forgings to United States Steel, Room 5299, 525 William Penn Place, Pittsburgh 30, Pa.

## USS QUALITY FORGINGS



Heavy machinery parts—carbon, alloy, stainless

Forged steel rolls and back-up roll sleeves

Electrical and water wheel shafts

Specialty forging of all types

### UNITED STATES STEEL

Final inspection. Piece has been heat treated, machined and subjected to dozens of critical tests. Now, it's a USS Quality Forging.



Here's one reason why Michigan Tractor Shovels can move more yards per day, day after day...

## USS MAN-TEN Steel provides extra strength and toughness in bucket and bucket boom

**D**ESCRIBED AS "a bear for punishment and a hound for work" this big-yardage earth mover built by Clark Equipment Co., Construction Machinery Division, of Benton Harbor, Mich., is so engineered that every part contributes to high capacity operation and continuous, long-time service.

Use of USS MAN-TEN High Strength Steel in both bucket and bucket boom is typical of the care taken to ensure maximum durability and freedom from breakdown.

USS MAN-TEN Steel with a yield point of 50 000 psi—one and a half times that of ordinary carbon steel—readily provides the stamina needed to handle full buckets hour after hour. Its 40% higher fatigue strength safely absorbs shock and vibration when working the shovel into heavy, hard-to-dig material. Its greater abrasion resistance pays off in materially reducing bucket wear.

All these benefits inherent in USS MAN-TEN Steel combine to promote more dependable and more efficient shovel performance. They are obtained with no increase in weight, at little or no increase in cost.

**TO HELP YOU** — Our "Design Manual for High Strength Steels" contains comprehensive and practical information that you will find extremely useful in designing your product for greater efficiency and economy by the sound use of high strength steels. For your free copy, write on your company letterhead, giving title or department, to United States Steel Corporation, Room 5299, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

Contact our nearest office and let us show you how you can apply USS MAN-TEN or our other High Strength Steels—USS COR-TEN and USS TRI-TEN—in place of carbon steel, to make your equipment *better*—able to do more work—able to last longer—with fewer stops for service and maintenance.



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NATIONAL STEEL DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS

How SHELL MOLDING  
with G-E shell resins

# CUTS COSTS

for **CRUCIBLE**

STEEL COMPANY OF AMERICA



Ask Crucible Steel about shell molding with General Electric shell resins and you'll get a glowing report on *better castings at lower cost!* For Crucible finds the shell process ideal for casting parts in its new Rexalloy\*—a super-hard alloy that's too tough to machine easily, too expensive to waste through machining allowances. Shell-molded Rexalloy parts are often usable as cast—far smoother and sharper than conventional sand castings—much less expensive than investment castings. To obtain these benefits, Crucible uses G-E shell resins, relying on them for batch-after-batch uniformity and properly balanced properties.

\*Reg. trademark, Crucible Steel Company of America.

#### How can shell molding help YOU?

General Electric offers a number of products to help foundrymen get maximum benefits from the shell process: G-E phenolic shell-molding resins to form light, dimensionally accurate molds . . . G-E silicone release agents to free molds easily from patterns . . . G-E phenolic bonding resin to cement shell halves together.

*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

#### Ask G. E. about shell molding!

General Electric maintains a shell-molding laboratory in Pittsfield, Mass., to help users and prospective users of shell molding solve problems and evaluate the process. G.E. also offers a 28-page manual describing the techniques and benefits of this new foundry method. *Just mail the coupon for a free copy!*

#### FREE SHELL-MOLDING MANUAL!

General Electric Company  
Section 4F302  
Chemical and Metallurgical Division  
Pittsfield, Massachusetts

Please send me a free copy of G-E Shell Molding Manual.

- ☐ We are presently using the shell-molding process.  
☐ We are interested in the shell-molding process.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Street \_\_\_\_\_



Here's one reason why Michigan Tractor Shovels can move more yards per day, day after day...

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

## USS MAN-TEN High Strength STEEL



6-296

U N I T E D   S T A T E S   S T E E L

How SHELL MOLDING  
with G-E shell resins

# CUTS COSTS

for **CRUCIBLE**

STEEL COMPANY OF AMERICA

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#### FREE SHELL-MOLDING MANUAL!

General Electric Company  
Section 6F3D2  
Chemical and Metallurgical Division  
Pittsfield, Massachusetts

Please send me a free copy of *G-E Shell Molding Manual*.

☐ We are presently using the shell-molding process.

☐ We are interested in the shell-molding process.

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## A Report on Automatic Arc Welding

# A G-E WELDING ENGINEER EXPLAINS ARE TURNING MORE AND MORE TO



Roger W. Tuthill, Welding Process Engineer for the General Electric Company's Welding Department, answers some of the more frequently asked questions about the gas-shielded, consumable-electrode welding process.

Mr. Tuthill's answers explain the increased attention this process is receiving from production and welding people as automation begins to make greater demands on production welding.

Mr. Tuthill has been active in research and development on Fillerarc welding, General Electric's gas-shielded process, and has had a number of papers published on the subject.

### Q. What is the gas-shielded welding process?

A. Gas-shielded welding is a consumable-electrode arc welding process which uses a reel of bare electrode wire fed mechanically through a welding head. Gas, such as carbon dioxide or argon, flows around the electrode to form a protective shield about the arc.

### Q. Is there anything particularly new about gas-shielded arc welding?

A. Yes—if you're talking about *automatic* gas-shielded arc welding!

Historically, powdered flux has been used as the shielding agent in automatic arc welding, mainly because no gas process was economically feasible for welding mild steel. However, gas-shielding was attractive to many prospective users because it eliminated the many problems created by the use of flux—expensive flux recovery systems, flux inclusions in welds, flux in the air, more precise fixture requirements, and other difficulties.

Gas-shielding has been used for welding non-ferrous and stainless steels, but the relatively high costs of the inert gases used made gas-shielding impractical for mild steels.

Recently, the successful application of low-cost carbon dioxide as a shielding gas has finally made it economical to use gas-shielded equipment for welding mild steels. For example gas savings of 90% over inert gas costs have been reported. Since by far the most welding being done today is on mild steel, it is easy to see why this development is causing so many production people to turn to automatic gas-shielded arc welding for answers to their production welding problems.

### Q. Does a gas-shielded automatic welding system cost any more than other automatic arc welding systems?

A. The cost of setting up a gas-shielded system is about the same as for a comparable submerged-arc automatic system.

For example, while the *purchase* price of gas-shielded automatic equipment may be more than that of a submerged-arc system, the fact that there is no need for installing expensive flux recovery equipment and other cleaning systems with gas-shielded welding easily makes up the purchase price difference.

### Q. Does the quality of welding done with gas-shielding compare with other welding processes?

A. Quality of welds made with the gas-shielded automatic welding process compares very favorably with other processes. Since no flux is used there is no possibility of flux inclusions; penetration is usually deeper; and the visible arc permits full control during welding. This visible arc permits less expensive fixtures to be used, an important cost factor in automatic welding.

### Q. How about the speed and flexibility of a gas-shielded system? Can it be easily integrated into a production line?

A. A gas-shielded system can be used in production line welding as easily as any automatic welding system.

For example, the G-E Fillerarc system has electrode wire feed speeds which range up to 1000 inches per minute.

# WHY FABRICATORS OF MILD STEEL AUTOMATIC GAS-SHIELDED WELDING

The automatic head can be rotated through 360 degrees and can be used for circular or seam welds, and, if necessary, more than one welding head can be used to make multiple welds.

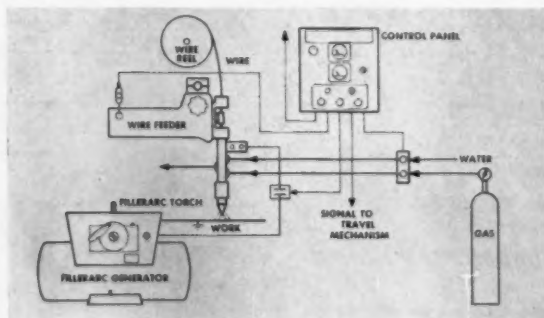
These characteristics make the Fillerarc system flexible and fast enough for almost any production line. Perhaps of equal importance to production people is the system's insensitivity to incoming line voltage, which assures constant production speed and weld quality.

## **Q. To sum up, what are the really important advantages of the automatic gas-shielded welding process?**

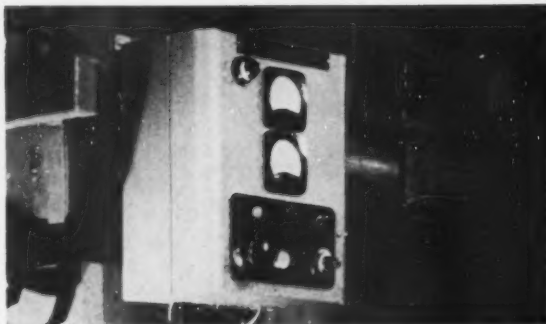
A. In a few words, the most important advantages of the automatic gas-shielded process are flexibility, high welding speeds, uniform weld quality, elimination of the cleaning problems associated with the use of flux, versatility for use with all types of metals, and most important of all, the ability to use low-cost carbon dioxide for shielding.

For more information about Fillerarc automatic gas-shielded welding see your nearby G-E Welding Distributor, or write for Bulletin GEC-1334, Section 713-4, General Electric Company, Schenectady, N. Y.

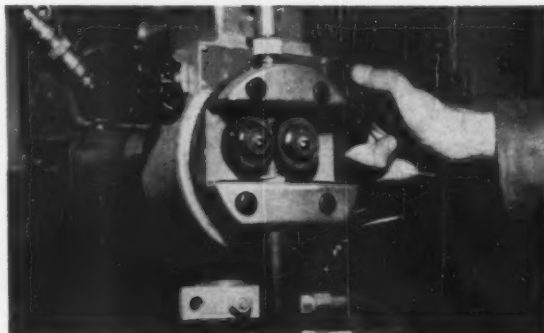
**See G-E Fillerarc automatic welding equipment demonstrated at the American Welding Society Convention, Buffalo, N. Y., May 9-11. Booth numbers 47, 48, 49.**



**G-E FILLERARC EQUIPMENT** is the only complete equipment especially designed for consumable-electrode, gas-shielded welding. Simplicity of the system makes possible use of less expensive fixtures and greater over-all efficiency.



**WIDE RANGE OF WIRE-FEED SPEEDS**—up to 1000 inches per minute—makes the G-E Fillerarc system flexible enough for any production line. Speed is constant since system is insensitive to normal line-voltage changes.



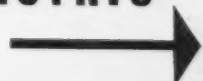
**FLEXIBILITY OF FILLERARC SYSTEM** is also demonstrated by the automatic head. It rotates 360 degrees, allowing even overhead welding. Arc is completely visible since gas is used as the shield instead of flux.



**CIRCULAR OR SEAM WELDS** may be made on stainless steel, copper, aluminum, and other metals—using inert gas. Fillerarc power sources, rectifier or motor-generator, and carbon dioxide combine for low-cost, quality welds on mild steel.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**



# ANNOUNCING ...



## 3 NEW G-E Power Sources for Automatic Welding

Now, three new General Electric 800-amp rectifier welders join the already-proved Fillerarc 450-amp motor-generator set as power sources for the expanding gas-shielded automatic welding process.

The three new power sources are designated FILLERARC, REGULARC, and DIRECTARC and offer a complete choice of output characteristics and automatic features. (See comparison chart below.)

**FILLERARC**—gives you the ideal power source for automatic gas-shielded welding. Like the 450-amp Fillerarc motor-generator, this rectifier welder has a unique rising volt-ampere characteristic which automatically matches the arc require-

ments for all electrode wire feed speeds. It is immune to changes in incoming line voltage, thus assuring consistent weld quality.




**REGULARC**—The first *true* constant-potential power source offered for automatic welding, this welder provides all the features of the Fillerarc model except that it has a flat volt-ampere characteristic. This is the set for you if your application requires regulation of incoming line voltage and only relatively small changes in electrode wire feed speeds.

**DIRECTARC**—With minimum investment, Directarc offers the same high quality design and construction of the other models without the automatic features.

Directarc is the choice for you if you have a well-regulated incoming line voltage and your application requires only one arc length and electrode wire-feed speed.

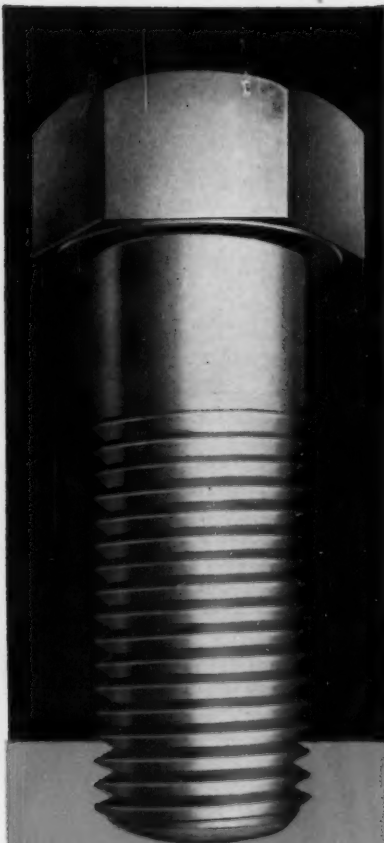
**QUALITY RECTIFIER FEATURES**—All three models offer the same high quality you've come to expect in G-E rectifier welders—quiet operation, combination cleaning-cooling fan, easily removable side covers, and Class H silicone insulation.

For more information see your nearby G-E Welding Distributor (He's listed in the yellow pages of your phone book) or write Section 713-5, General Electric Company, Schenectady 5, N. Y.

Power Source	Output Volt-ampere curve	Immune to Incoming Line Voltage Change	Adjustable Starting Voltage	No Change in Arc Length with Change in Electrode Wire Feed Speed
 <b>FILLERARC</b>	Rising	Yes	Yes	Yes
 <b>REGULARC</b>	Flat	Yes	Yes	No
 <b>DIRECTARC</b>	Essentially Flat	No	No	No

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**



Lamson 1035 Double Heat Treated High Tensile Cap Screws have long been favorites where extra strength and durability is required.

To attain this extra strength, Lamson Cap Screws are first heat treated at about 1600° F. and then quenched. This imparts "hardness". Then the screws are "drawn", or re-heated, to between 900° F. and 1100° F. and then quenched in a special oil.

This results in a minimum tensile strength of 150,000 pounds per square inch.

**Lamson  
&  
Sessions**

# Lamson

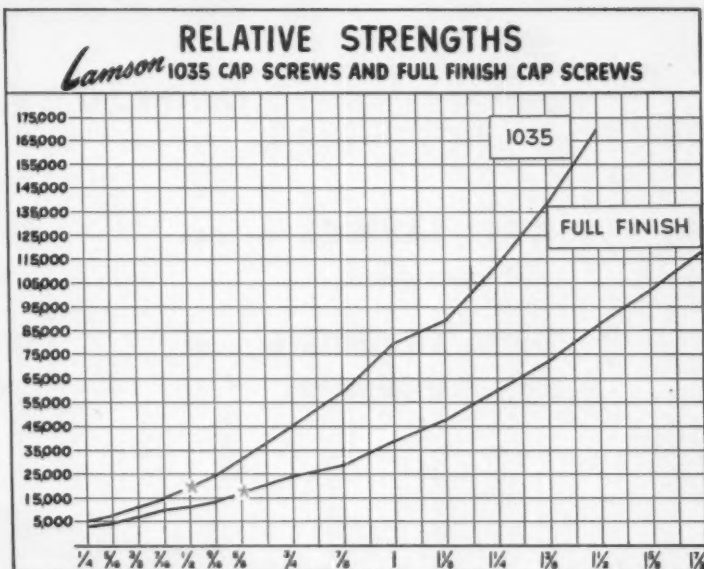
## 1035 CAP SCREWS OFFER GREATER STRENGTH AT... Less Cost!

If you are now using Full Finished Screws in your assembly operations it will pay you to consider substituting Lamson 1035 Double Heat Treated Cap Screws.

The extra relative toughness of Lamson 1035's enables you to use screws of smaller diameter, yet with equal, or greater, tensile strength.

As an example of increased strength at less cost—on the chart below you will see that a  $\frac{1}{2}$ "\* diameter Lamson 1035 Cap Screw has greater tensile strength than a  $\frac{3}{8}$ "\* diameter Full Finished Cap Screw. This means savings in weight and size of assembly.

As for money savings—Lamson  $\frac{1}{2}$ " x 2" 1035 Cap Screws are net priced at \$5.36 per hundred as compared to \$7.59 per hundred for the  $\frac{3}{8}$ " x 2" Full Finished Screw. Proportionate savings can be made all along the line.



YOU GET MORE WHEN YOU BUY FROM...

*The* **LAMSON & SESSIONS Co.**

1971 West 85TH St. • Cleveland 2, Ohio

CLEVELAND AND KENT, OHIO • BIRMINGHAM • CHICAGO



Once again!  
**THE BIG ADVANCEMENTS**

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**NEW AND  
REVOLUTIONARY**

# **SUPER TUMBLAST**

*provides:*

**SUPER SAVINGS** in cost  
of operation

**SUPER TIGHT** machine  
construction

**SUPER SAVINGS** in cost  
of maintenance

**SUPER BLASTING**  
wheelabrator unit

1926



**Endless Belt  
TUMBLAST**

1933



**The  
Airless  
WHEELABRATOR**

1934



**Wheelabrator  
MONORAIL  
CABINET**

1935



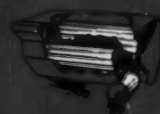
**Wheelabrator  
MULTI-TABLE**

1939



**Wheelabrator  
SWING TABLE**

1940



**Wheelabrator  
CONTINUOUS  
TUMBLAST**

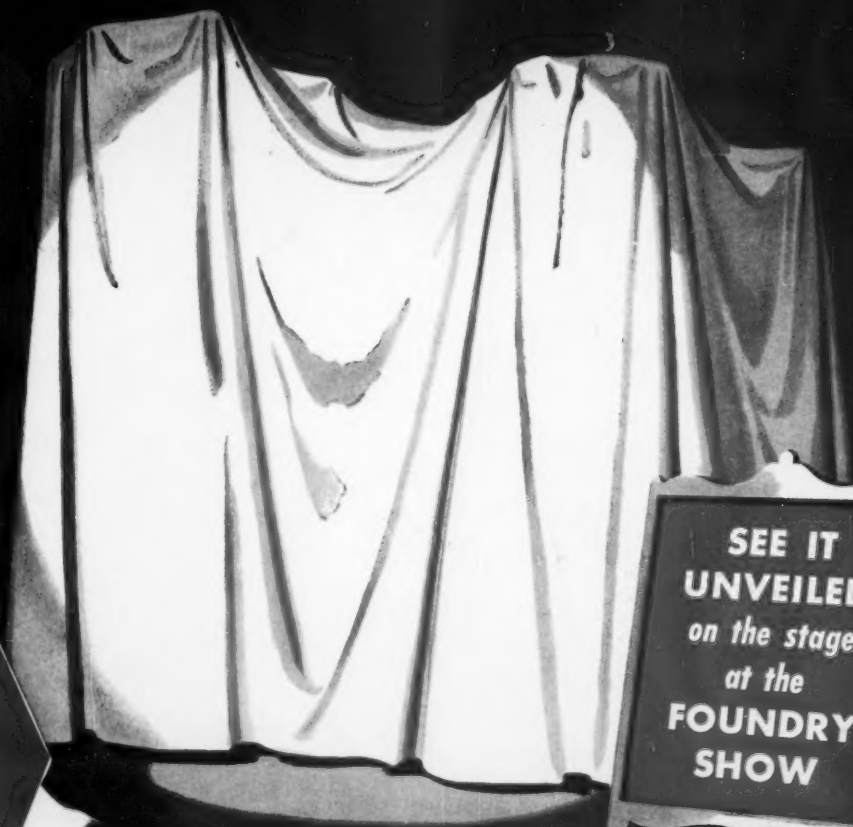
1946



**STEEL SHOT**

**COME FROM WHEELABRATOR®**

**IN BLAST CLEANING DEVELOPMENTS**



**1956**

**WHEELABRATOR  
SUPER  
TUMBLAST**

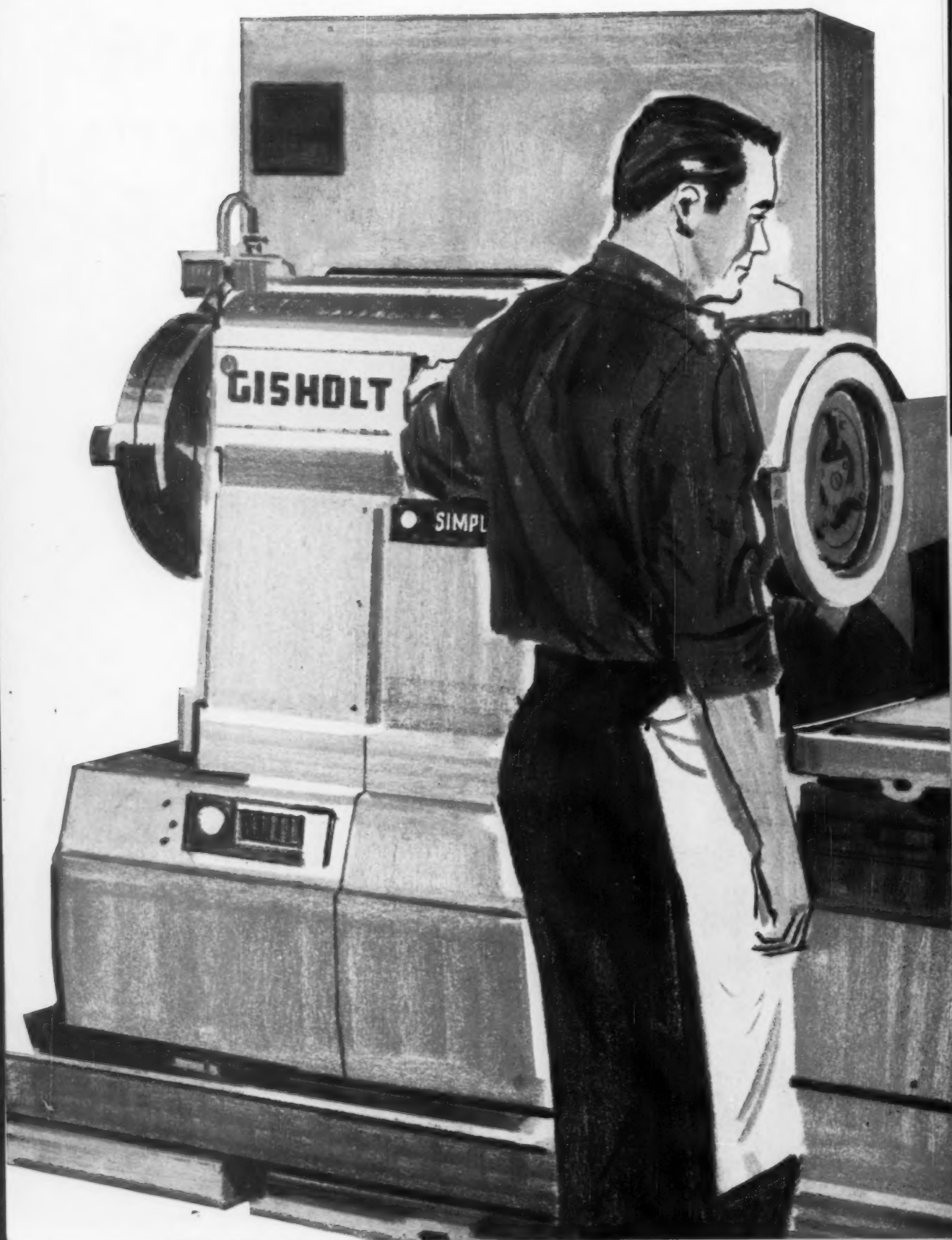
**SEE IT  
UNVEILED  
on the stage  
at the  
FOUNDRY  
SHOW**



**WHEELABRATOR**  
CORPORATION

510 S. BYRKIT STREET, MISHAWAKA, INDIANA

*World's Largest Builders  
of Airless Blast Equipment*

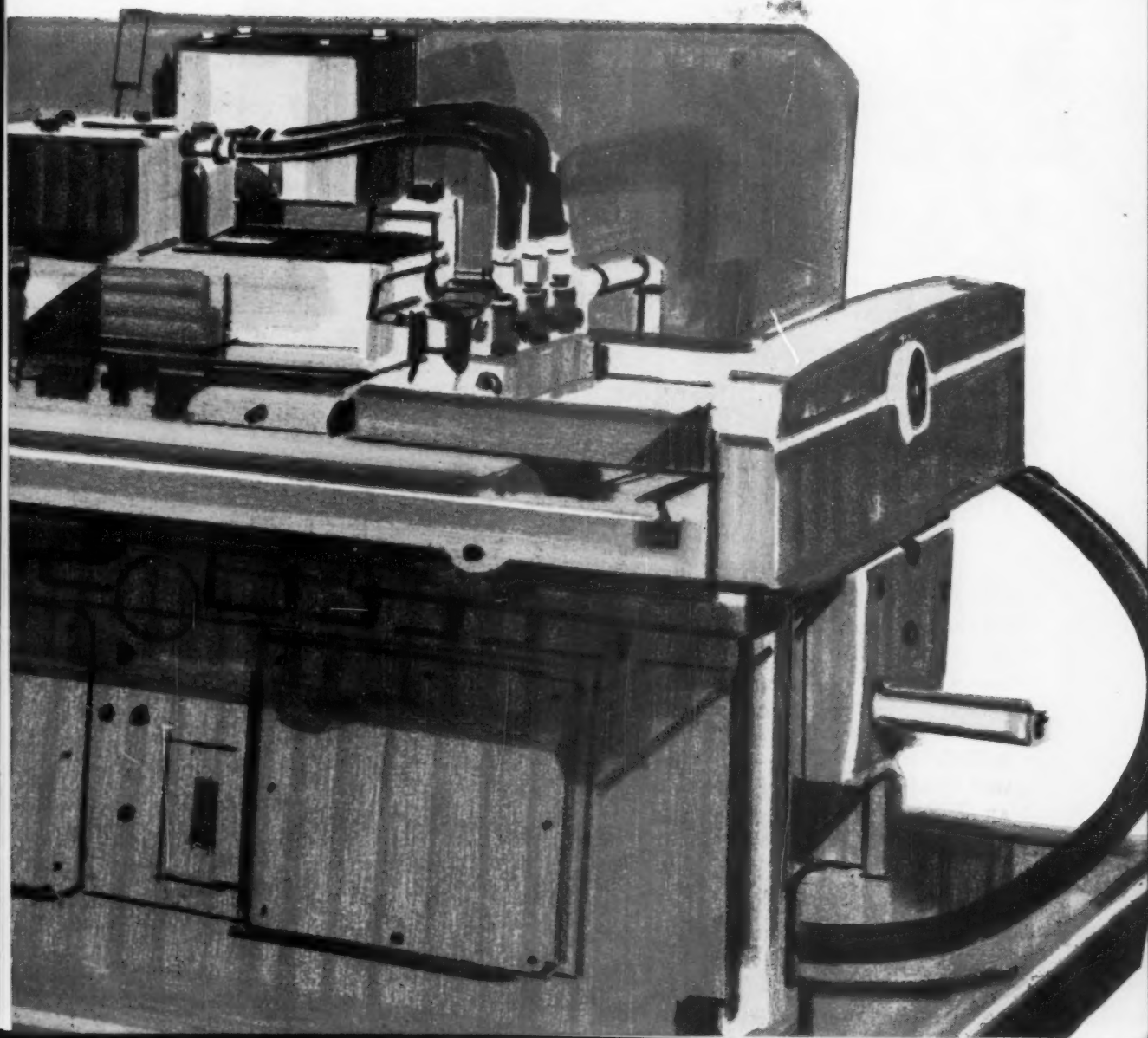


GISHOLT MASTERLINE  
SIMPLIMATIC  
AUTOMATIC LATHE



This is the latest design of the Gisholt MASTERLINE Simplimatic. There are many important improvements and outstanding features. Operation is faster. Setup and change-over are quicker. Maintenance is lower. In short, here is an advanced design for better work at lower cost—and with new minimum requirements for operator skill, attention and effort. Let us tell you more about these improved machines—and how they may be applied profitably to your manufacturing processes.

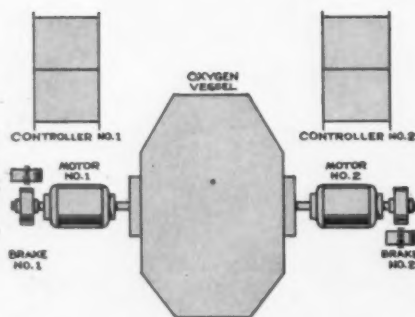
Gisholt Machine Company, Madison 10, Wisconsin  
*Look ahead—keep ahead—with Gisholt*





Installation Photos., courtesy of McLouth Steel Corporation.

**ANOTHER  
FIRST  
BY EC&M...**



## STEEL IN MINUTES FROM SCRAP AND HOT METAL

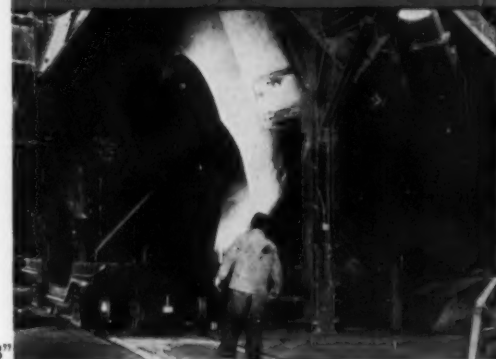
Photo "A" shows the scrap car charging scrap into the tilted oxygen vessel. The hoppers on these cars are also used for carrying other additives to the converter. When charging Hot Metal, as in Photo "B", the ladle and the vessel are tilted in unison toward each other for accurate metal transfer.

All operations (tilt and propel) of these cars are EC&M Controlled. Propel motions are also equipped with EC&M Type WB Brakes.

The first Oxygen Converter installation in the United States was built by Pennsylvania Engineering Corp. and is EC&M controlled.



"A"



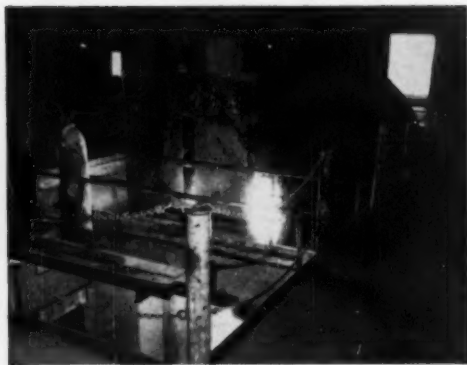
"B"

# ELECTRIC MOTOR CONTROL FOR OXYGEN CONVERTERS

For simplicity and maximum safety . . . the scrap car, hot metal car and oxygen vessel tilt, shown here, are equipped with constant potential drives using series wound motors and series brakes.

EC&M Magnetic Controllers provide maximum dependability for all drives and maintain high production under the safest conditions.

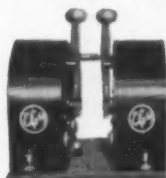
We invite you to discuss control for this newest hot metal application at your convenience. Call an EC&M engineer to learn the advantages of this safe, low-cost control for hot metal handling.



HOT METAL poured from converter vessel into ladle-car below. EC&M Control provides slow speed to avoid spills . . . to permit safe pouring speeds.

## CONTROL APPARATUS WITH A REPUTATION FOR SAFE HANDLING OF HOT MOLTEN METAL

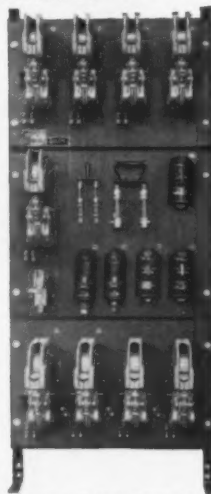
- 2 BRAKES
- 2 MOTORS
- 2 CONTROLLERS
- 2 MASTER SWITCHES



EC&M Bulletin 1190 Cam Master Switches, mechanically connected by quickly detachable coupling.



EC&M Bulletin 1110-2 Rotating Cam Limit Switch for car-ladle tilt.



Typical EC&M TIME-CURRENT Controller for Hot Molten Metal Service. Of the Reversing-Plugging Type, with Armature shunt slow-down on first point.



EC&M Bulletin 1110-1 Type E Limit Switch for car positioning.



EC&M Type WB Brake with 2 separate series windings, one for each motor circuit.



TAB-WELD Plate Resistors Bulletin 942

This EC&M Control System avoids dangerous spills, because each motor circuit is electrically independent, and separate controllers are operated from a double Master Switch with quickly detachable coupling. Should one motor fail . . . no knife, transfer or disconnect switches need be operated to continue operation with one motor.



**THE ELECTRIC CONTROLLER & MFG. CO.**

DIVISION OF SQUARE D COMPANY

4498 Lee Road

Cleveland 28, Ohio

# REPUBLIC ALLOY

A 5/8-inch Republic Alloy Steel Double Chain Sling is used to move this four-ton gear blank safely and easily. Republic Alloy Slings are ideal for applications demanding lightweight and extremely high-working load limits.



# REPUBLIC



*World's Widest Range of Standard Steels*

# STEEL CHAIN SLINGS

## Are Safe, Strong, Lightweight, Easy to Handle

For hazardous, heavy-duty lifting and overhead materials handling, nothing exceeds the modern chain sling made from *alloy steel*. This means it is one of the safest, strongest and toughest pieces of equipment you can have around the shop.

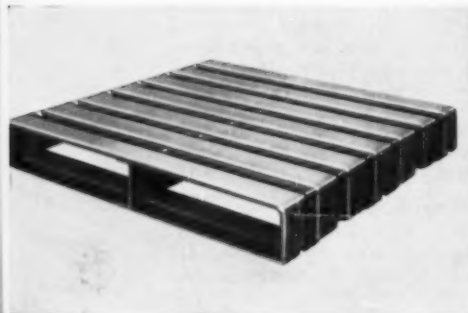
Republic enters the alloy chain sling picture in three ways. (1)—Republic is the world's largest producer of alloy steels. (2)—The high strength-to-weight ratio and corrosion-resistance of Republic Alloy Chain have encouraged the use of smaller and lighter chain slings to carry heavier loads safely. Also resulting in greater efficiency, longer service life and ultimate economy. (3)—Craftsmen at Republic's Bolt and Chain Division form the alloy steel into chain, then into chain slings engineered for the highest degree of safety. Each sling is proof tested and warranted to meet or exceed specifications.

Republic Alloy Chain is made from special analysis open hearth steel, quality controlled from ore to fin-

ished product. It is heat treated to develop the highest possible tensile strength and maximum resistance to wear, shock, strain and work hardening. Stress relieving or reheat treating is unnecessary.

Your Republic Chain Distributor has complete information on alloy slings, high test steel and wrought iron slings, as well as fittings, and accessories.

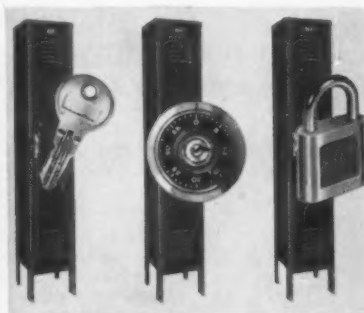
**This New Republic Catalog** contains complete information and the latest, up to date specifications on Welded Chain, Accessories and Assemblies. It's a colorful, 62-page book loaded with everything you need to know about welded chain. Order your copy from your Republic Chain Distributor. Or write us direct. Ask for Catalog 701.



**SAFETY DIRECTORS APPROVE OF REPUBLIC STEEL PALLET.** There are no sharp edges or projections to injure workmen or damage containers. Republic Pallets are fabricated from steel to eliminate maintenance expense—designed to eliminate broken deck members and stringers, protruding fasteners and joint failures. Republic Steel Pallets are available in many styles including the P-16-S Semidouble Face shown above. Write for Pallet Booklet No. 616.



**SAFETY IS A BUILT-IN FEATURE OF REPUBLIC WEDGE-LOCK STEEL SHELVING.** It is specifically designed for high stacking of enormous weights. Joints actually get tighter as weight increases. And there's no sagging, swaying or buckling. Wedge-Lock Steel Shelving provides maximum loading in minimum floor space. It is completely flexible to meet your changing space requirements and can be assembled quickly and easily.



**SAFETY OF EMPLOYEES' PERSONAL PROPERTY** is provided by Republic Steel Lockers with a choice of three locking systems—combination—padlock—key operated. These modern steel lockers, available in many types and styles, conserve space and offer clean, safe storage for employees' clothing and valuables. Republic's Berger Division offers a complete locker planning, engineering and installation service. Send coupon for more information.

# STEEL

*and Steel Products*

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3104 East 45th Street • Cleveland 27, Ohio

Please send more information on:

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|---|--|
| <input type="checkbox"/> Chain Slings                   | <input type="checkbox"/> Steel Pallets |
| <input type="checkbox"/> Wedge-Lock Steel Shelving      | <input type="checkbox"/> Lockers       |
| <input type="checkbox"/> Send Welded Chain Catalog 701. |  |

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

## CF&I STEEL PRODUCING PLANTS

### CF&I Pueblo, Colorado

Blast Furnaces and Open Hearths producing pig iron, ingots, blooms, billets and rods.

### CF&I Buffalo, New York

Blast Furnaces and Open Hearths producing pig iron, ingots, blooms, billets and rods.

### CF&I Claymont, Delaware

Open Hearths producing ingots and steel plate.

### CF&I Roebling, New Jersey

Open Hearths producing ingots, blooms, billets, and rods.

### CF&I Brooke, Pennsylvania

Blast Furnaces producing basic, Bessemer, foundry, malleable and low phosphorus pig iron.

# QUALITY IS AN "EVERY-

## CF&I FABRICATING PLANTS

The quality of CF&I steel products is firmly controlled since the requirements of each product determine the analysis of the steel.

### CF&I Buffalo, New York

Fine and Specialty Wire of all types including Manufacturer's Wire (Basic, Spheroidized, Annealed, Tempered, Bright and Liquor Finish, Low and High Carbon)—Welded Wire Fabric—Chain Link Fence—Galvanized Strand.

### CF&I Claymont, Delaware

Flanged and Dished Heads—Carbon and Alloy Steel Plates—Stainless-Clad Plates—Nickel Electro-Clad Plates—Manhole Fittings and Covers—Large Diameter Welded Steel Pipe—Flame Cut Steel Plate Shapes.

### CF&I Clinton, Mass.

Poultry Netting—Hex Mesh Nettings—Hardware Cloth—Industrial Wire Cloth—Alloy Processing Belts—Perforated Metals—Overhead Conveying Equipment—Sliding Door (Industrial) Hardware.

### CF&I Mt. Wolf, Pennsylvania

Insect Wire Screening and Industrial Wire Cloth.

### CF&I Oakland, Calif.

Fish and Crab Trap Netting—Stucco Netting—Poultry Netting—Hardware Cloth—Industrial Wire Cloth—Straightened and Cut Wire—Reinforcing Tie Wire—Mechanic's Wire—Chain Link Fence—Crimped Wire.

### CF&I Palmer, Mass.

Wire Rope—Wire Rope Slings—Wire, all types (see Buffalo Plant)—Wire Clothesline—TV Guy Wire—Aircraft Control Cable.

### CF&I Pueblo, Colo.

Bar, Rod and Structural Products—Grader blades and Cutting Edges—Rails and Accessories—Chain Link Fence—Woven Wire Fence—Fence Stays—Fence Posts—Corn Cribbs—Welded Wire Fabric—Nettings—Grinding Balls and Rods—Screen and Grizzly Bars—Rock Bolts—Galvanized Strand—Clothesline—Barbed Wire—Manufacturer's Wire (Basic, Chain, Spring, Stapling, Weaving, Welding)—Merchant Wire (Annealed and Galvanized)—Nails—Bolts—Nuts—Spikes—Seamless Casing and Tubing.

### CF&I Roebling, N. J.

High Carbon Steel Wire (Hard Drawn, Spheroidized and Tempered)—Rope Wire—Tire Bead—Hose Wire—ACSR Core Wire—High Carbon Spring Steel Wire (All grades, tempers and finishes)—Regulator, Sash Balance and Flapper Valve Wire.

### CF&I Roebling (Trenton), N. J.

High and Low Carbon Flat Wire (All tempers, edges and finishes)—Brush, Corset, Casing, Heddle and Drop Wire, Umbrella Wire and Tape Lines—Wire Rope—Strand, Aircord and Fittings—Wire Rope Slings—Electrical Wire and Cable and Magnet Wire.

### CF&I So. San Francisco, Calif.

Galvanized and Annealed Merchant Wire—Galvanized and Annealed Stone Wire—Bale Ties—Baling Wire—High and Low Carbon Wire—Galvanized and Annealed Wire—Copper Coated Wire—Rope Wire—Welding Wire.

### CF&I Worcester, Mass.

Valve and Clutch Springs—Starter Springs—Tire Chain Adjusters—Cross Chain Repair Links—Mechanic's Wire—Compression, Extension and Tension Springs of all types—Formed Wires.

# STEP" OPERATION

*at*



**THE COLORADO FUEL AND IRON CORPORATION**  
**DENVER • OAKLAND • NEW YORK**

*T*here's only one positive way to make sure that steel products will give long-lived, trouble-free service. That's to start with a system of rigid quality controls even before the iron ore goes into the blast furnace—and constantly maintain these controls throughout every stage of production until the product is shipped.

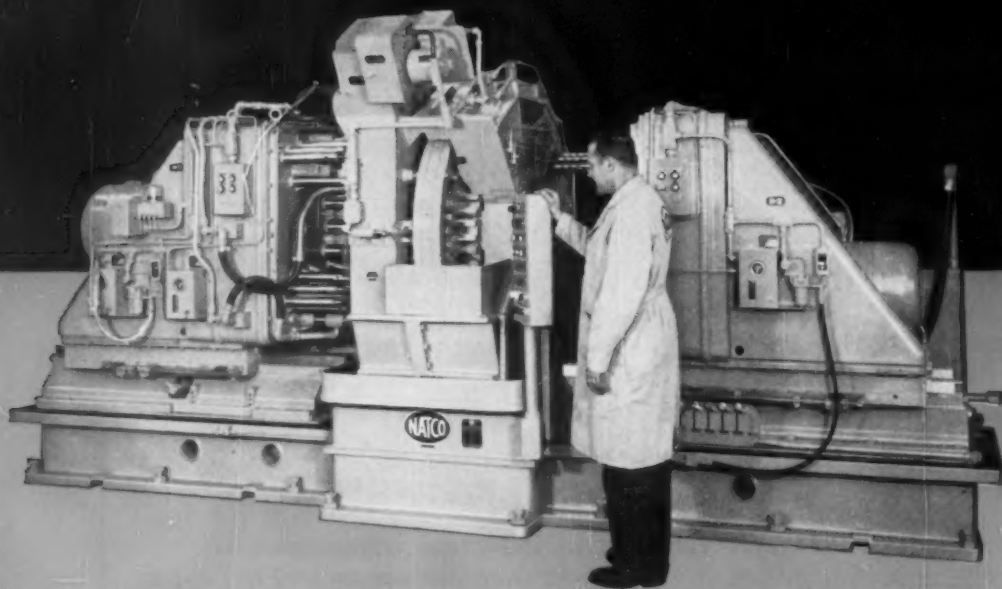
This is the policy at CF&I. Quality control is an "every-step" operation which is part of the job at every CF&I plant.

What's more, CF&I offers you another important advantage—a widely-diversified line of steel products from one source which enables you to get the exact size and type of product that's best for your particular job.

Next time you're in the market for steel or steel products, it'll pay you to contact CF&I.

3490

# New Natco<sup>®</sup> Performs 17 Operations Every 15 Seconds

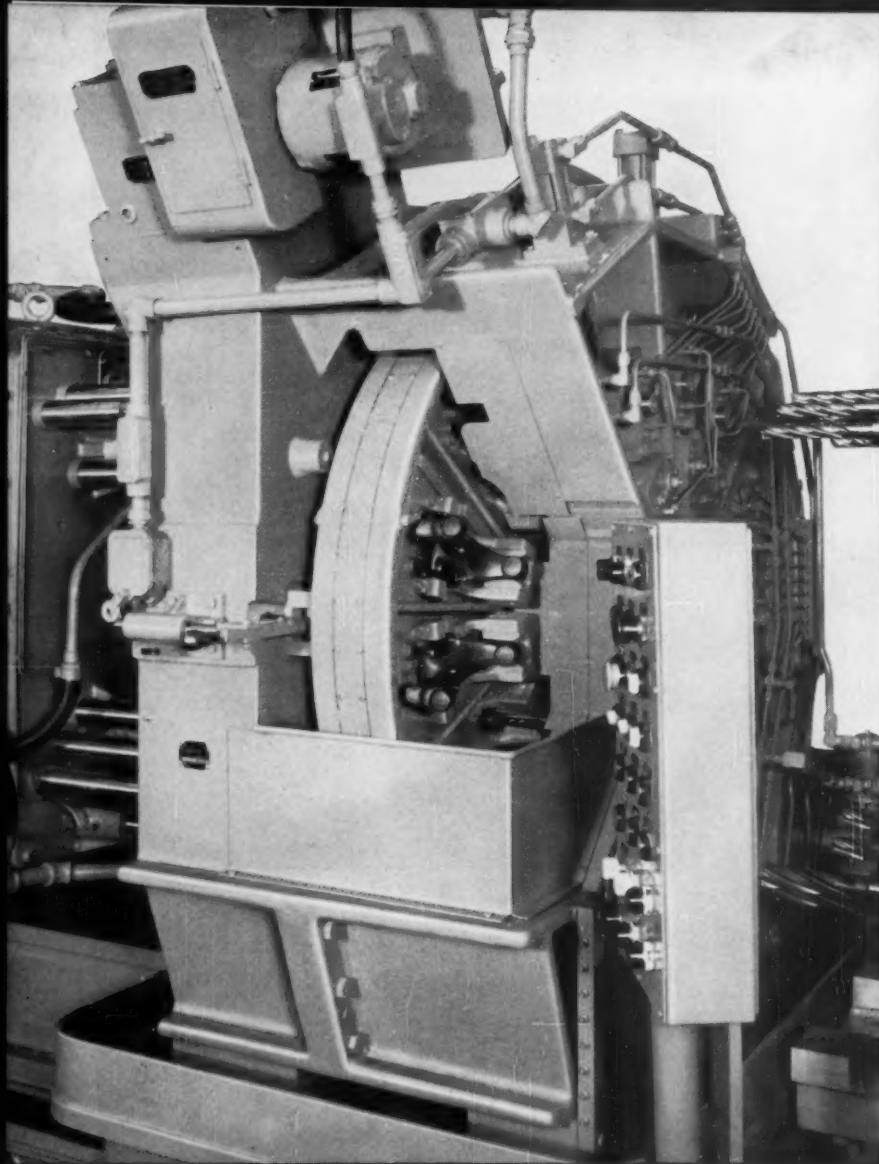


**Performance**—this Natco 2-way horizontal drilling machine produces 250 steering knuckles per hour. Holds limits as close as .004". Parts are clamped automatically in the interlocked trunnion fixture—spot-drilled, drilled, spotfaced, reamed and counterbored.

**Features**—Automatic time delay reverse, positive stop, coolant system with magnetic chip separator, automatic lubrication to heads and ways, hydraulic feed and J. I. C. compliance. Let a Natco field engineer help you with your drilling, boring, facing and tapping problems.



*Ask for information about the PAYD (Pay-As-You-Depreciate) finance plan.*



## Notes from Natco...

### Whole Hog or Piecemeal

Seems like two distinct approaches are being taken in the adoption of automatic assembly methods. The "whole hog" school favors abrupt change... wait until you can install a machine that will handle the *complete* assembly job. The "piecemeal" school favors a step-by-step transition, starting with the basic transfer mechanism and adding automatic stations one or two at a time.

### Variety Show

The critics say you can't have high production and versatility, too. But one of our eastern customers has run his drilling show that way for years. On seven adjustable multi-spindle Natcos, he drills and taps over 1000 different parts in lots from 50 to 10,000.

### Shuttle for Speed

Like the Three Musketeers, drilling, chamfering and tapping go together. Natco is now building sliding tables for their small standard machines allowing all three operations with one push of the button. Starting in drilling position, table automatically indexes for chamfering and tapping; then returns. Up to 24 operations at a crack.

### Processed by Natco Machines



*Part:* Gear Housing

*Machine:* Natco vertical Holesteel

*Operations:* Drill 11 holes; Counterbore 1 hole; Chamfer 3 holes; End cut ream 1 hole; Combination ream, face and chamfer 1 hole; Ream 3 holes.

*Production:* 90 per hour

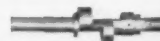


*Part:* Cylinder Block

*Machine:* Natco Holesteel

*Operations:* Drill 17 holes in 4-cylinder block or 23 holes in 6-cylinder block.

*Production:* 40 parts per hour



*Part:* Shaft

*Machine:* Natco H-5

*Operations:* Combination drill and chamfer 3 holes; Drill 4 holes.

*Production:* 80 parts per hour

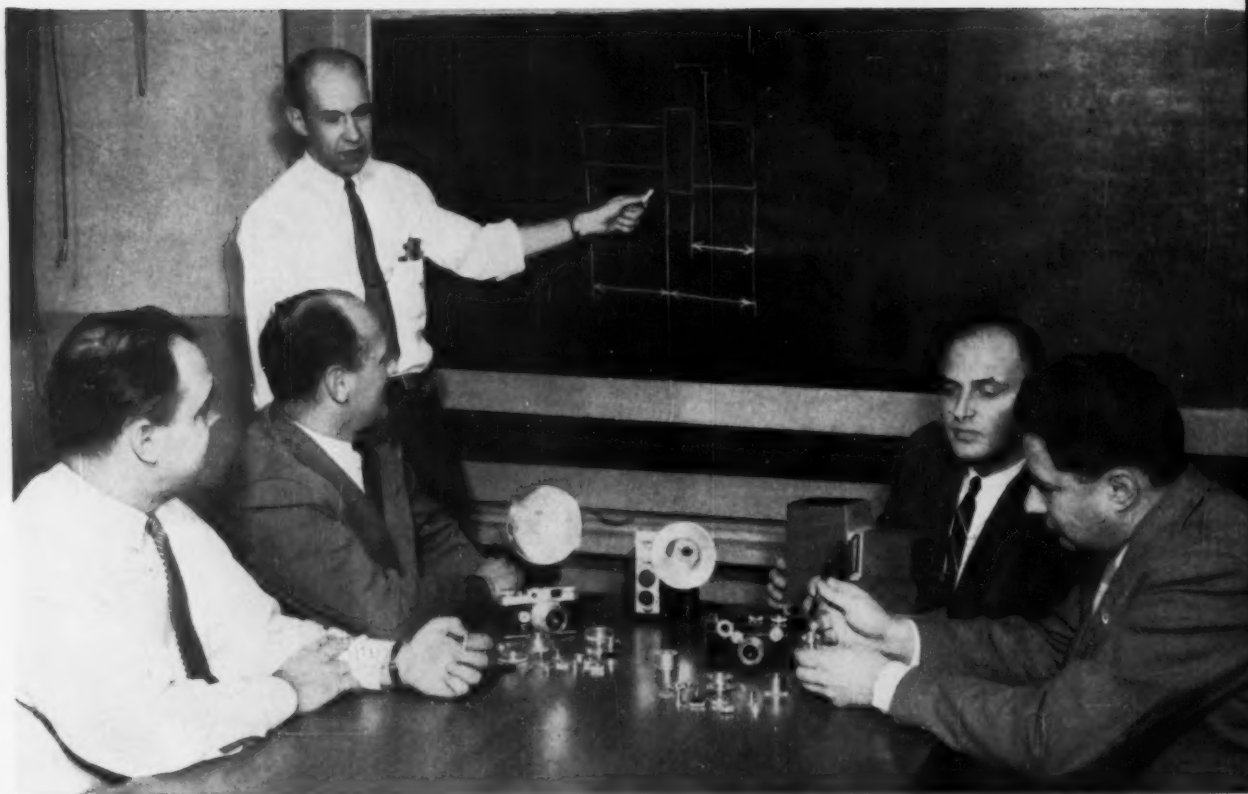
**NATIONAL AUTOMATIC TOOL COMPANY, INC.**

Richmond, Indiana

*Multiple-spindle drilling, boring,  
facing and tapping machines  
Special machines for automatic  
production*



Call Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.



A typical new product planning session at Argus includes, from left to right: N. L. Symons, Director of Purchases; G. D. Flannery, Purchasing Agent; M. K. Carr, Chief Product Engineer; J. N. Steel,

Advertising Manager; C. F. Myers, Superintendent of Mechanical Processing.

## A VISIT TO ARGUS\* TO SEE WHAT THEY'RE DOING WITH ALCOA SCREW MACHINE STOCK

Born in the depths of the 1931 depression, Argus Cameras, Inc., now occupies the country's leading position as a manufacturer of 35 mm cameras. Aluminum plays a major role in making the broad Argus line of photographic equipment light, lasting and above all salable. Projector housings are die cast in aluminum. Lens housings, rewind knobs, focusing mechanisms are made of Alcoa® Aluminum Screw Machine Stock. One characteristic is common to all screw machine parts made by Argus. That characteristic is precision. Tolerances in "tenths of thousands" are commonplace. Diamond turned finishes are routine. Jewel-like appearance is a production byword.

Although quality appearance is mandatory at Argus, it may not be a requirement of your product. Consider, then, the other reasons why the trend to aluminum screw machine parts can no longer be bucked: excellent machinability of today's free-cutting Alcoa alloys . . . electrical and thermal conduc-

tivity . . . corrosion resistance. High performance of the finished part, coupled with the solid economic fact that you get three times as many parts per pound as with heavy metal, makes up the total "good sense" of aluminum. These are hard commercial reasons why aluminum, more than ever before, should be carefully considered for every screw machine part you make or specify. Help in this type of analysis is available for your product from every one of Alcoa's local sales offices listed in your phone book under "Aluminum." ALUMINUM COMPANY OF AMERICA, 870-D Alcoa Building, Pittsburgh 19, Pennsylvania.





Purchasing session on aluminum screw machine parts and stock is held by: N. L. Symons, Director of Purchases (left) and Purchasing Agents, L. H. Thomas (center) and G. D. Flannery (right).



Design consultation on aluminum parts includes: Chief Product Engineer, M. K. Carr (standing) and Assistant Chief Product Engineer, E. O. Zill (seated).



Inspecting fine finish on aluminum lens mounts are: A. E. Danner, Shop Foreman (left) and C. F. Myers, Superintendent of Mechanical Processing (right).

## IN PURCHASING

"Our purchasing department at Argus demands dependability from suppliers. It is this single fact that has characterized our relationship with Alcoa over the past 11 years. We have never had a reject of Alcoa Screw Machine Stock. Alcoa's research and development aid are always available when needed. We don't believe you could ask more of a supplier than we get willingly from Alcoa."

## IN DESIGN

"The low cost of aluminum is a tremendous factor in the manufacture of a volume product like cameras. But beyond that, we in design lean heavily on aluminum for the better product it makes possible. Light weight and corrosion resistance are mandatory in cameras. The permanent black anodized finish, possible with aluminum, has led to its use in place of brass for some parts like lens-retaining rings. Freedom from plating makes parts like lens mounts and focusing mechanisms more practical in aluminum than brass or steel.

"In design considerations, the combination of Alcoa literature and Alcoa technical assistance gives us firm foundations of fact on which we can make decisions."



Typical parts machined by Argus from Alcoa Aluminum Screw Machine Stock.

## IN PRODUCTION

"We machine aluminum at tremendous feeds and speeds. Many of our parts require 75% stock removal. For these, the machinability of aluminum and its high scrap value stand us in good stead. The fine finish, so necessary to camera parts, is easily attainable with Alcoa Screw Machine Stock. And in this respect, consistency of quality from one shipment to the next is perhaps the place where Alcoa serves us best. Fine threads and close tolerances are second nature to us. We like the way aluminum gives us these qualities without constant tool change and lost setup time."

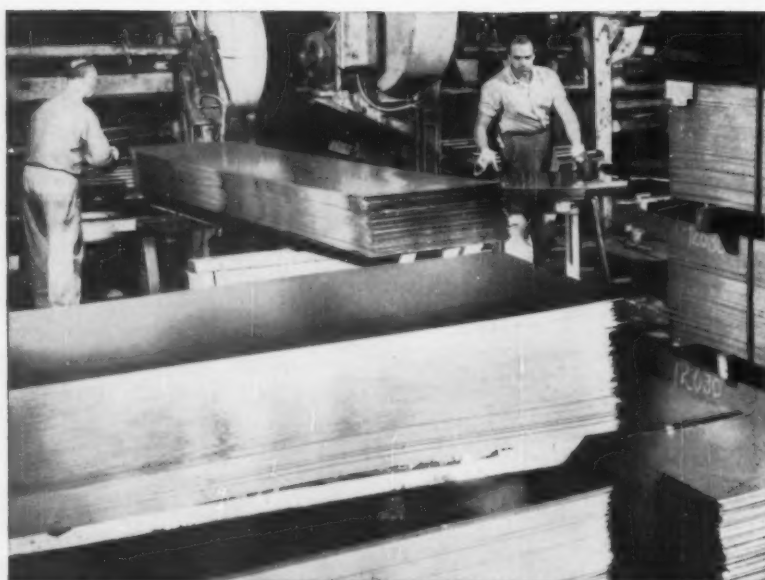


Your Guide to the Best  
in Aluminum Value





## Quality Sheet From Pittsburgh Steel Cuts Cost Of Kitchens



Sheets are sheared for cabinet base floor and cutting board guides.

Helps Build  
Long Life, Beauty  
And Durability into . . .

*Youngstown Kitchens*

Youngstown Kitchens Division of American Standard is the world's largest producer in its field.

Gleaming Youngstown Kitchens have developed an excellent reputation for quality over the past 25 years. Much of this is due to the steel sheets going into sink, wall and base cabinets turned out at Youngstown Kitchens' big Salem, Ohio, plant.

Like many other major sheet users in the automotive and appliance fields, Youngstown Kitchens has come to depend on quality sheet from modern rolling facilities of Pittsburgh Steel Company. Youngstown demands steel sheet that will meet all requirements for precision in its kitchens. At the same time, the steel must enable Youngstown Kitchens to keep its production costs in line to meet the vigorous competition of the kitchen unit field.

Here are the qualities Pittsburgh Steel's sheet delivers uniformly to help make better Youngstown Kitchens at lower cost:

- **Top Notch Internal Quality** is reflected in the sheet's accurate chemical analysis and proper grain structure. Freedom from defects reduces scrap and cuts down the number of inspections necessary. Sinks and cabinets move quicker on the assembly line.

- **Superior Surface** is a characteristic of all Pittsburgh Steel's sheets. A clean, bright and reflective surface on the sheet assures a proper base for enameling. A surface short of the best lets blemishes show through after enamel has been applied.

- **Flatness And Dimensional Uniformity** in the sheet are important to the manufacturer. Pittsburgh sheet makes good on both counts. Absence of waves in sheet makes a trimmer-looking product to catch the eye of the ultimate customer. Youngstown Kitchens can rely on Pittsburgh Steel to provide cold rolled sheet that will not vary in thickness from sheet to sheet or from shipment to shipment.

- **Shapeliness In The Sheet** means it performs well on forming machines, retains its inherent strength while assuming graceful, functional shapes which add beauty to Youngstown Kitchens.

Uniform sheet characteristics like these have built a big demand for Pittsburgh sheet steel. Not every producer can match Pittsburgh sheet's uniformity, so if you require uniform high quality, investigate its advantages today. A phone call to the nearest district office will bring quick results. And your order will get prompt, personal attention from the time it is entered on the books until you receive the shipment.



In final assembly drawers and hardware are added.



Surface cleanliness shows up in bond of sprayed enamel.

## Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

### District Sales Offices

Atlanta	Columbus	Detroit	New York	Tulsa
Chicago	Dallas	Houston	Philadelphia	Warren, Ohio
Cleveland	Dayton	Los Angeles	Pittsburgh	



**NOW FROM SCIAKY...**

**the most significant development  
in the history of resistance welding**

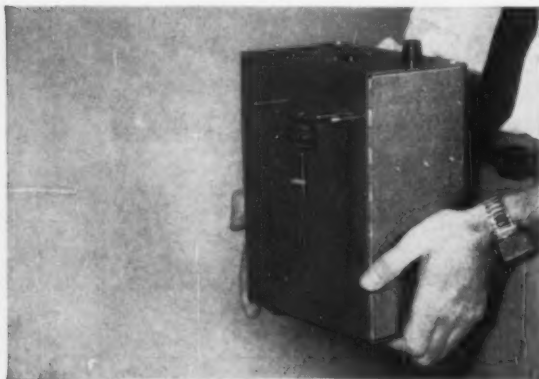
## **AT LAST, ABSOLUTE ACCURACY IN WELDING CONTROL**

**The Sciaky Predetermined Electronic Counter Weld Control  
Produces Absolute Weld Consistency and Positive Reproducibility**

To the long line of Sciaky firsts in resistance welding is now added the most important of them all—the Sciaky Predetermined Electronic Counter Weld Control. Now resistance welding can easily and economically provide fastening to satisfy *your* standards of production. . . No matter how rigid they are. . . No matter how long or short your production runs!

### **THE LOGIC AND SIMPLICITY OF CONCEPT**

Without deviation, this new Sciaky control counts the cycles of power line frequency which is governed by the U. S. Naval Observatory. In predetermined absolute numbers the cycles and impulses of the various welder functions are simply counted by a Dekatron tube. A single tube is used to count both the respective cycles of succeeding functions, as well as the impulses of welding current. The positive adjustment snap switch control dials are logically calibrated in these same cycles and impulses.



Close up of a typical unitized, plug-in sub-assembly.

### **ABSOLUTE CONSISTENCY**

Control settings are realized with exactness. No relays are necessary during the entire welding sequence. The unvarying accuracy of counting is maintained throughout the entire range for the longest run at the highest production rate, and is readily reproducible at any time.



Note the ease with which a plug-in new function unit can be added.

### **EASE OF MAINTENANCE OR ADDITION OF FUNCTIONS**

The entire control is designed to permit the greatest possible ease and speed of maintenance or addition of functions through the use of separate plug-in sub-assembly units. Down time is minimized since it takes only minutes to install a spare or an additional function.

### **WRITE FOR DESCRIPTIVE BULLETINS**

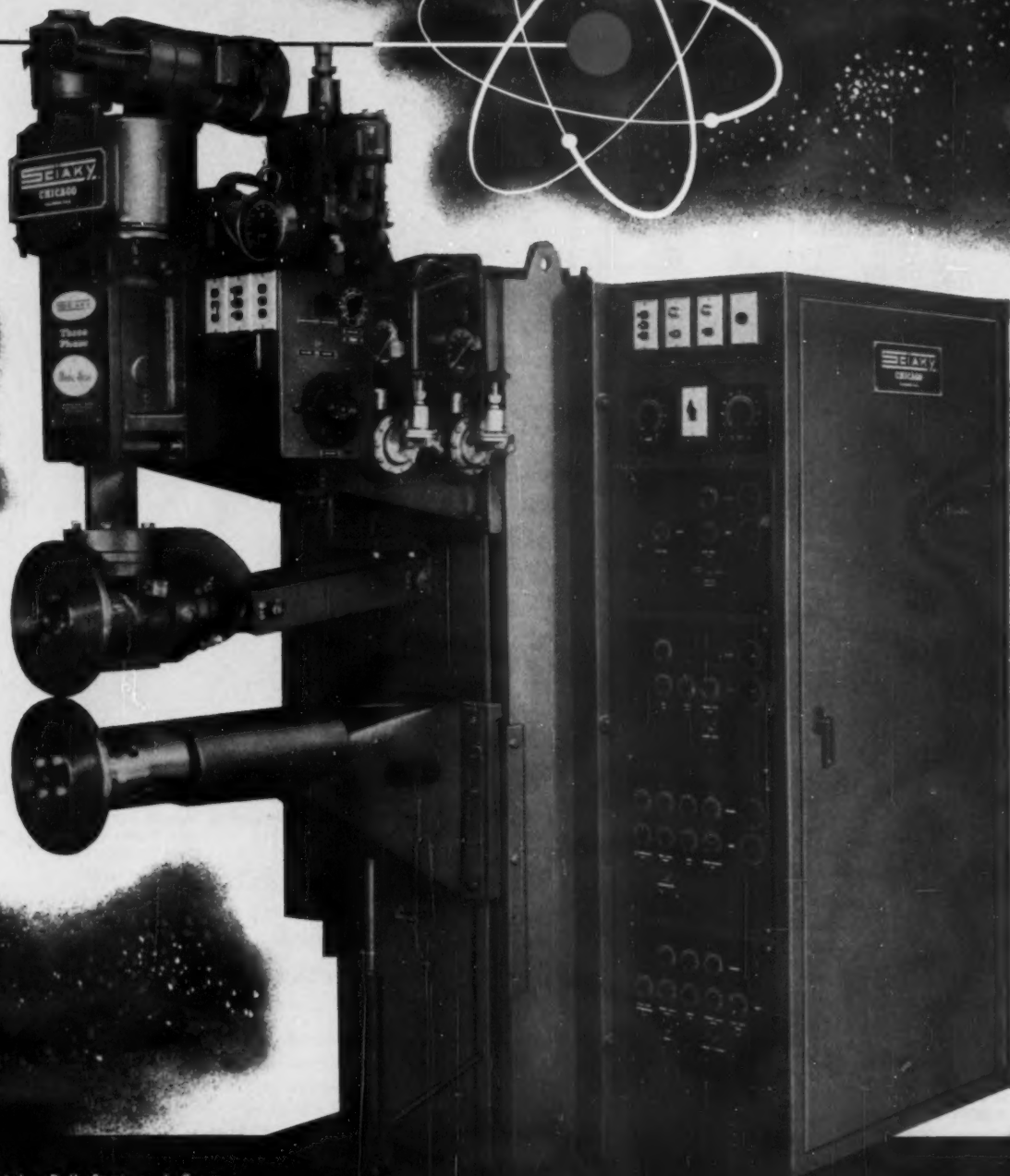
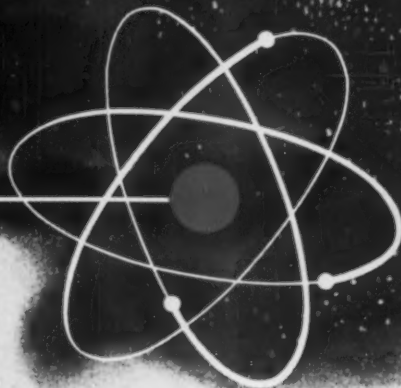
Further technical, operation and application data is presented in Bulletins No. 338 and No. 339. Write or 'phone for your copies, today. There is no obligation.

**Sciaky Bros., Inc., 4923 West 67th Street,  
Chicago 38, Ill., Portsmouth 7-5600**

*Largest Manufacturers  
of Resistance Welding Machines in the World*

**See it in  
ACTION**

The Sciaky Predetermined Electronic Counter Weld Control will be introduced publicly at the Welding Show in Buffalo, May 9-11. You are cordially invited to see it in action in Booth No. 100.



Sciaky Roll Spot and Seam Welder equipped with the Sciaky Predetermined Electronic Counter Weld Control.

# SCIAKY





**PRECISE QUALITY CONTROL** Heart of the Curtiss-Wright System is a precision remote control manipulator mounted on the tank scanner assembly. It carries an underwater "search crystal" back and forth over the entire plate of aluminum, discharging vibrations of several million cycles a second which penetrate the metal. A cross sectional view of the material being inspected is presented by the "B" scan unit of the console.



**LOWER COSTS FOR QUALITY** The operating console provides complete control of scanner speed and sequences. Servo controlled mechanism provides four different scanning motions.

Photos courtesy Kaiser Aluminum & Chemical Corp., Trentwood, Wash. rolling mill

## Curtiss-Wright ULTRASONIC IMMERSCOPE

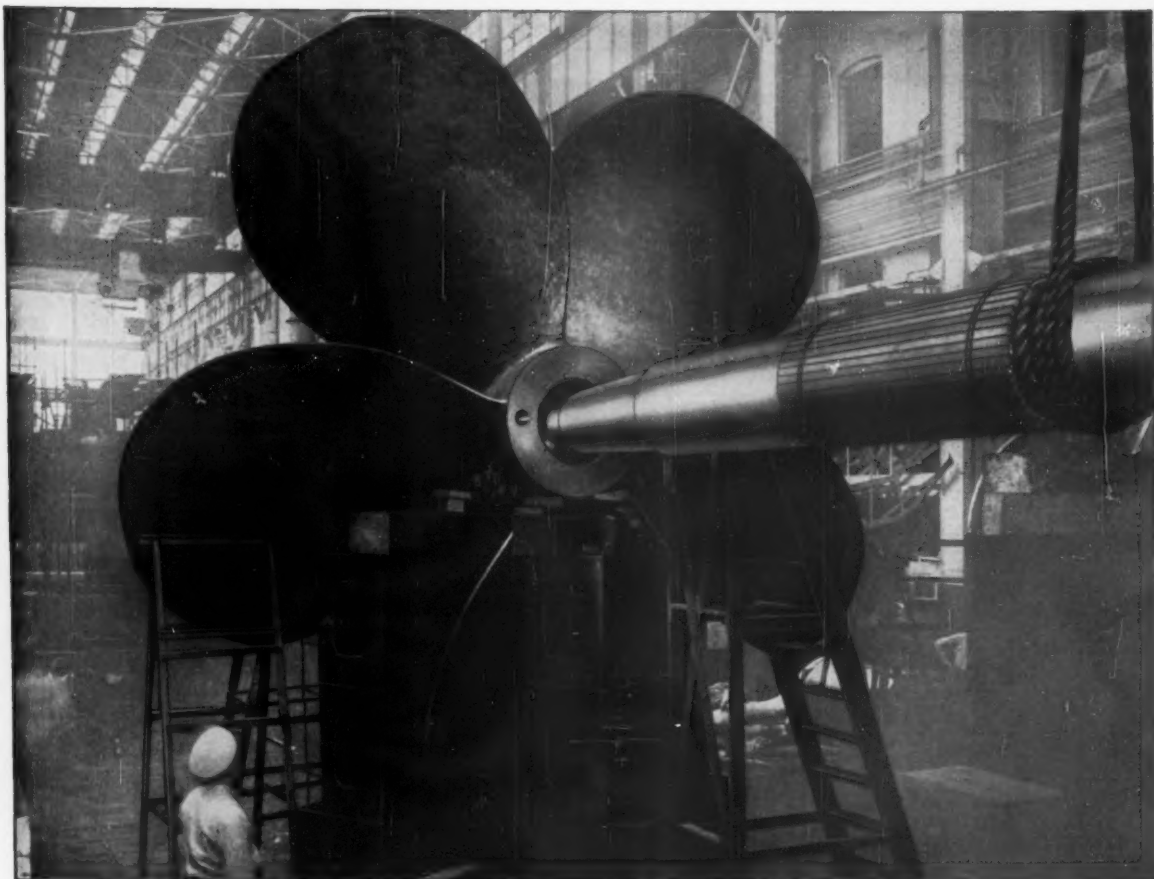
### GUARDS QUALITY FOR KAISER ALUMINUM

Rolled aluminum has to meet rigid quality specifications—a problem made to order for Curtiss-Wright Ultrasonic Test Equipment. This ultra-modern system uses high frequency vibrations to provide more accurate inspections at lower costs, whether for aluminum, forgings, welded tubing, rolled plate, extrusions or other metal products.

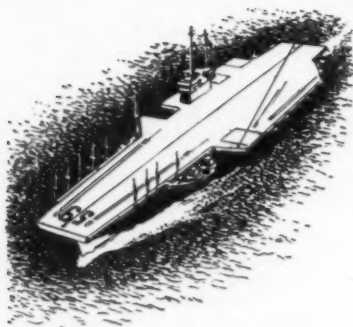
Any flaw is immediately translated into a visible reading on the cathode ray tube of the

Curtiss-Wright Immerscope. A built-in alarm system automatically marks the location of any flaw and at the same time provides visual indication of its size and location. By speeding inspection and reducing costs, Curtiss-Wright ultrasonics can give *your* production important quality control advantages. *For complete details write Industrial and Scientific Products Division, Curtiss-Wright Corporation, Caldwell, N. J.*





## Aboard the U. S. S. FORRESTAL . . . Erie Forge Propeller Shafts



**N**O better example of the capabilities of Erie Forge & Steel Corporation could be offered than the one above. For many years our skilled craftsmen have made steel ingots from raw materials, transformed them into finished products to meet the demands of power transmission in wide variety . . . finished cranks, rotor shafts, drive shafts, connecting rods, a wide diversity of steel castings for industry . . . completed within the confines of one plant with one responsibility and under one control.

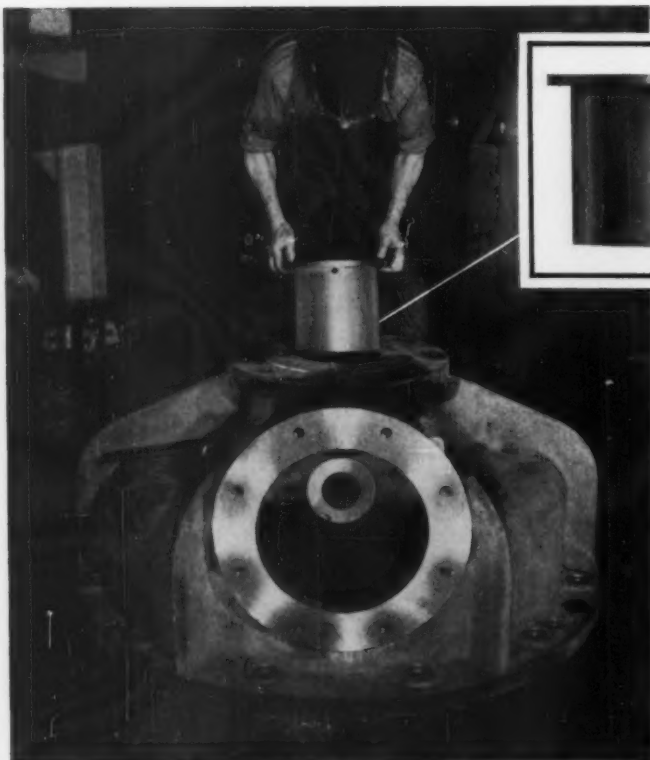
Consult with us on your forged steel and steel casting projects—each of us will profit.

ERIE FORGE & STEEL CORPORATION • ERIE, PENNSYLVANIA

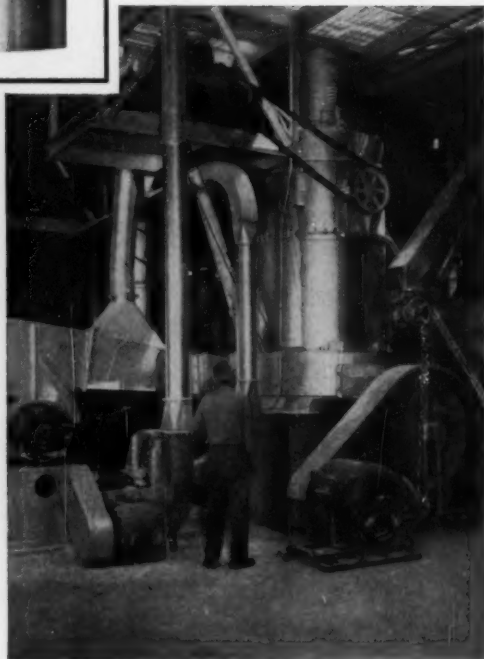


MEMBER AMERICAN IRON AND STEEL INSTITUTE





• Big pulverizing mills made by Raymond Division, Combustion Engineering, Inc., depend on Johnson Bronze Bearings for trouble-free performance the world over. At right is a high side roller mill installed in the Kaiser Gypsum Wallboard Plant at Seattle.



## Where One Bearing Can Keep Whole Plant From Shutdown

When you're investing up to \$85,000 for a pulverizing mill around which you're going to build an entire plant, you expect to get equipment which will give long, trouble-free performance.

One leading company in the field of designing and manufacturing pulverizing mills for use all over the world makes every effort to do just that—build sturdy equipment of the best available materials which won't break down because of the failure of any one part.

Because bearings play such an essential role in the operation of pulverizing mills, the Raymond Division, Combustion Engineering, Inc., has relied for more than 30 years on cast bronze bearings made by the Johnson Bronze Company of New Castle, Pa.

Johnson Bronze bearings rate high with this Chicago manufacturer because they can be depended upon to keep these expensive units on the job day in and day

out and because they are made just the way Raymond Division specifies. That means a very low rejection rate and faster production.

Take the big bronze bearings Johnson makes for journals on a pulverizing mill. They are made to a tolerance of .002 of an inch. Because Johnson consistently meets this specification, the time required to fit the bearing is held to a minimum. A few taps with a rawhide mallet usually slips the bearing into its position.

If your product demands uniformity, investigate Johnson Bronze products. You can depend on them for faster production and longer life in use. Skilled engineers are available to help you decide what type of bearing you need to get the best possible results at lowest cost. Johnson Bronze Company, 505 S. Mill Street, New Castle, Pa.

## Johnson Bearings



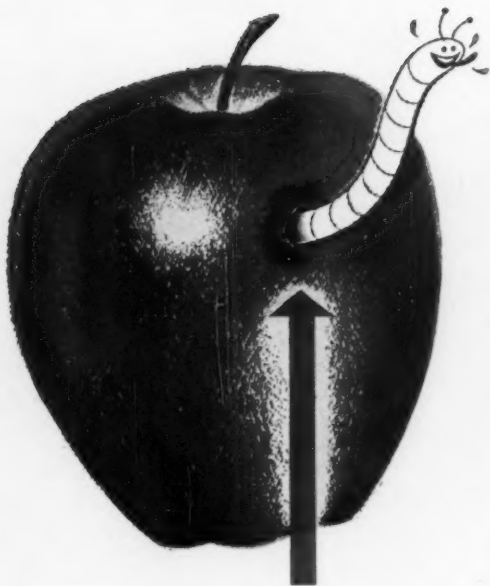
LEDALOYL  
(powder metallurgy)

ALUMINUM ON STEEL

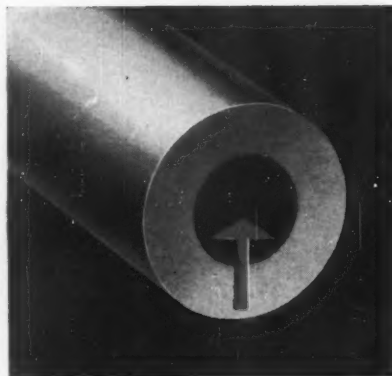
• BRONZE ON STEEL

• STEEL AND BABBITT

• CAST BRONZE



a hole here makes waste...



a hole here saves waste

**Crucible Hollow Tool Steels** save waste — time and money — whenever you need ring-shaped parts or tools with a center hole. For the hole is in the piece when you get it! You eliminate drilling, boring, rough-facing operations — save machine capacity for productive work.

And you can get Crucible Hollow Tool Steels in *any* of our famous tool steel grades . . . in bar lengths or saw cut to your individual requirements. They are made in practically any combination of O.D. and I.D. sizes. What's more, delivery is *immediate* with Crucible's popular KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air-hardening, and NU DIE V hot work tool steel grades from warehouse stocks.

Next time you have an application with a center hole, let your Crucible representative show you how these hollow tool steel bars can save you money and time. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE**

first name in special purpose steels

**Crucible Steel Company of America**

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

April 26, 1956

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# **FEDERAL WELDING PRESS . . .**

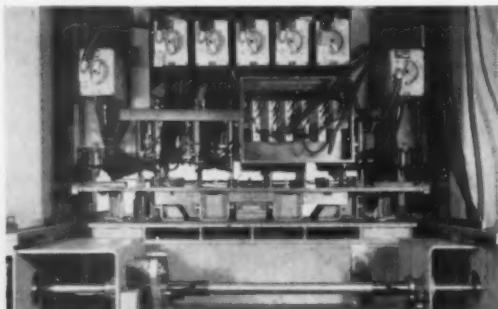
## **a complete seat frame with every press stroke!**

Frames for automobile seat backs and cushions are being resistance welded on Federal Welding Presses at the Great Lakes Spring Division of Rockwell Spring and Axle Co.

Only Federal can offer single company responsibility in supplying both the mechanical welding press and the welder tooling based on their long experience in both press (Warco) and resistance welder (Federal) manufacture.

There are many manufacturing operations existing today where a mechanical welding press would pay dividends. If you have one of them, why not contact the one company best suited to provide the answer? That's Federal — First in Resistance Welding. Welding Press brochure on request.

A variety of welding capsules can be used with these presses. For a changeover in product, simply change the tooling.



Close-up view of welding capsule.



There's no comparison between the old single weld method and this "automated" production line made possible through the Federal Welding Press.

SEE US IN BOOTH 73 AT THE WELDING SHOW

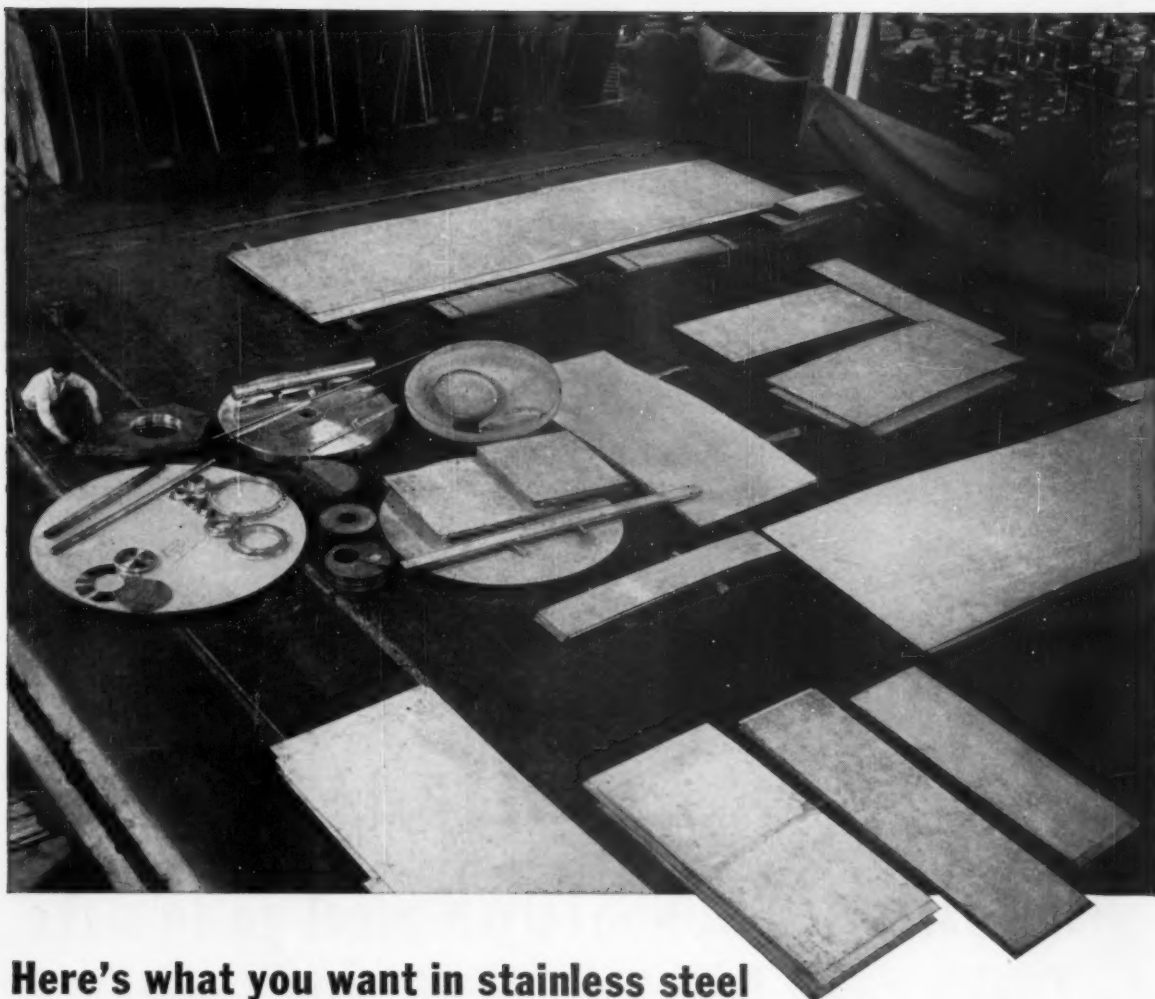
**The Federal Machine and Welder Company**

WARREN, OHIO

**Federal**  
WELDERS

**Warco**  
PRESSSES

9967



## Here's what you want in stainless steel —the way you want it

**Stainless Steel Plate** . . . produced to almost any size or thickness,  $\frac{3}{16}$ " and heavier, in rectangles or cut-to-shape. Carlson maintains what is probably the largest stock of stainless plate in the country—produced to highest chemical and metallurgical standards—ready for cutting to your requirements, and for shipment when you want it.

**Stainless Steel Heads** . . . spun or press formed to your order or taken directly from our stock of ASME and Standard flanged and dished heads—the *largest stock* maintained anywhere. In addition to supplying heads for tanks, heat exchangers, condensers and similar equipment, Carlson can fill a complete bill

of material including shell plates, flanges, rings, pads and other components.

**Stainless Steel Forgings, Circles, Rings, and Special Patterns** . . . Flanges, circles, rings, and sketch plates are cut from plate, or forged and rough machined to meet your specifications.

**Stainless Steel Bars and Sheets** (No. 1 Finish)

**Complete Service** . . . At Carlson the emphasis is on flexibility, efficiency and economy in producing what you want, when you want it. If you would like additional information about our service and products or, if you want to *place an order*—just let us know, we promise you prompt action!

write for CARLSON'S WEEKLY STOCK LISTS . . .  
YOUR GUIDE TO WHAT'S AVAILABLE  
IN QUALITY STAINLESS STEEL

*Stainless Steels Exclusively*  
**C. C. CARLSON, INC.**  
THORNDALE, PENNSYLVANIA

Plates • Plate Products • Forgings • Bars • Sheets (No. 1 Finish)  
District Sales Offices in Principal Cities

New Case "400" Tractor, shown here, is setting new standards of tractor capacity, convenience, comfort, appearance and over-all performance.



## Many parts of YOUNGSTOWN Steel go to make Case's "new from ground up" 400 Tractor

Not often does a farm equipment manufacturer create an entirely new tractor. Such a change is costly—both in time and in tooling costs. But, the J. I. Case Company of Racine, Wisconsin, did it with the Case "400" Tractor.

Another thing that Case did was to make sure that the "400" would be a quality product. That's why parts such as 4th and 8th speed gear seat reinforcement, rear axle shaft, differential shaft, reverse idler gear, front wheel spindle and many others are of Youngstown Steel. These parts utilize 5 different Youngstown Steel prod-

ucts: Hot Rolled Alloy Bars, Hot Rolled Carbon Bars, Hot Rolled Sheets, Cold Rolled Sheets and Standard Black Pipe.

In all Youngstown Steel products, you will find the same dependable uniformity, because Youngstown controls the complete manufacture from start to finish, with emphasis on quality throughout.

Let Youngstown help you with your steel problems. For information and service, get in touch with the local Youngstown distributor—or phone our nearest district sales office.

# Youngstown

**THE YOUNGSTOWN SHEET AND TUBE COMPANY**

Manufacturers of Carbon, Alloy and Incoloy Steel

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

# 2 OPERATIONS 1 MOTION



## Tap and Fasten Simultaneously with **EATON-RELIANCE** Thread-Cutting Springtites and Sems

Time expended and cost are both high in any production operation where metal must be tapped for bolt or screw type assembly. By eliminating the tapping operation, both of these factors can be reduced and resulting savings will be reflected immediately in the end cost of the product.

Eaton-Reliance Thread-Cutting Springtites and Sems have been designed specifically to give production men the advantage of accomplishing two operations with one motion. These fasteners tap and fasten at the same time.

In addition to the time and cost saving

advantages, Thread-Cutting Springtites and Sems assure a tightly fastened assembly. As threads are cut, the screws are seated firmly without allowing a chance for mismatching or stripping. An added plus is the preassembled Spring Washer, properly engineered to maintain constant tension. Put these fasteners to work in your assembly operation NOW.

Write for a visit from one of our fastening engineers or send for your free copy of Engineering Bulletin S-49A today.



# EATON

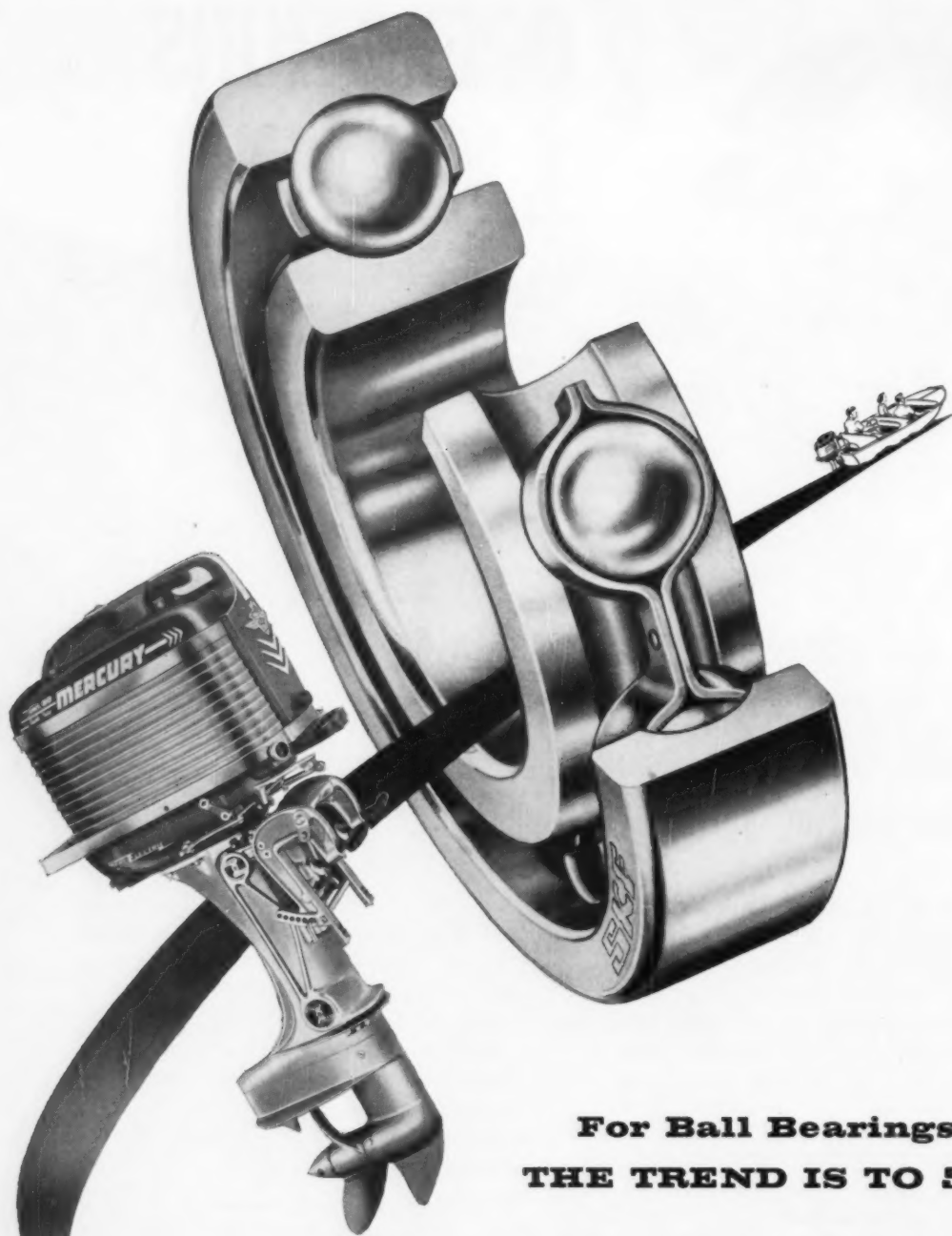
**RELIANCE DIVISION**  
**MANUFACTURING COMPANY**  
550 CHARLES AVENUE • MASSILLON, OHIO



SALES OFFICES: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

**PRODUCTS:** Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings • Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

April 26, 1956



**For Ball Bearings  
THE TREND IS TO SKF®**





Sleek, slim, powerful, quiet... *Mercury Outboards* are the ruler of speed and spray - "Master of the Waterways." Kiekhaefer Corporation, who makes them, was first to feature extensive use of anti-friction bearings in outboards. And Kiekhaefer is another concern that purchases single row, deep groove ball bearings from SKF.

It's a trend... brought about because those whose business is to buy bearings recognize the improvements SKF has achieved in ball bearings - improvements in quiet running, improvements in sealing, improvements in bearing life. Maybe you too should switch to SKF Ball Bearings.

**SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.**

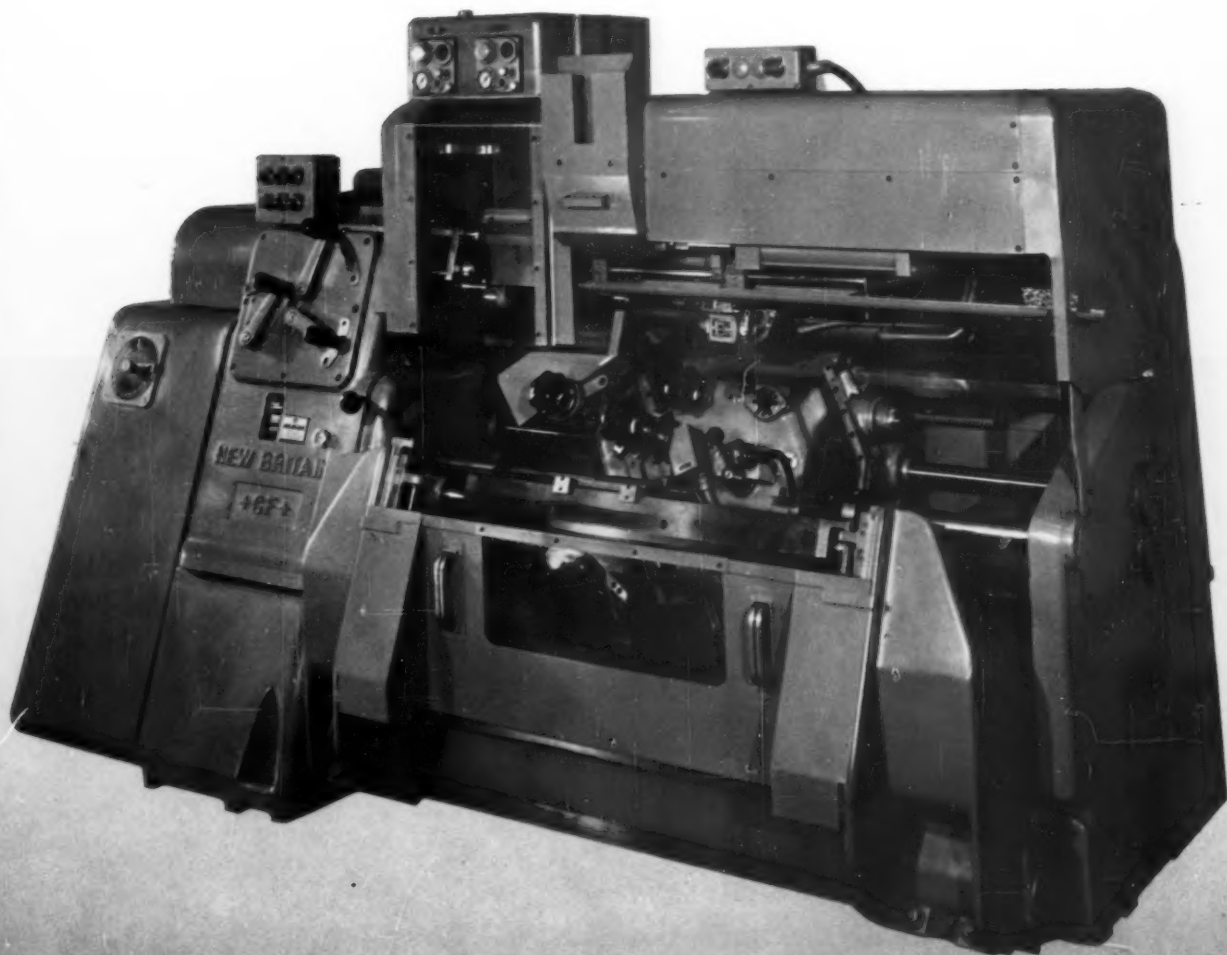
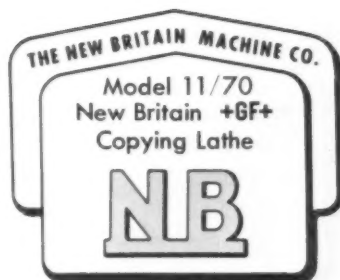
# SKF

**has them all**

Ball Bearings  Cylindrical Roller Bearings   
Spherical Roller Bearings  *Tyson* Tapered Roller Bearings 

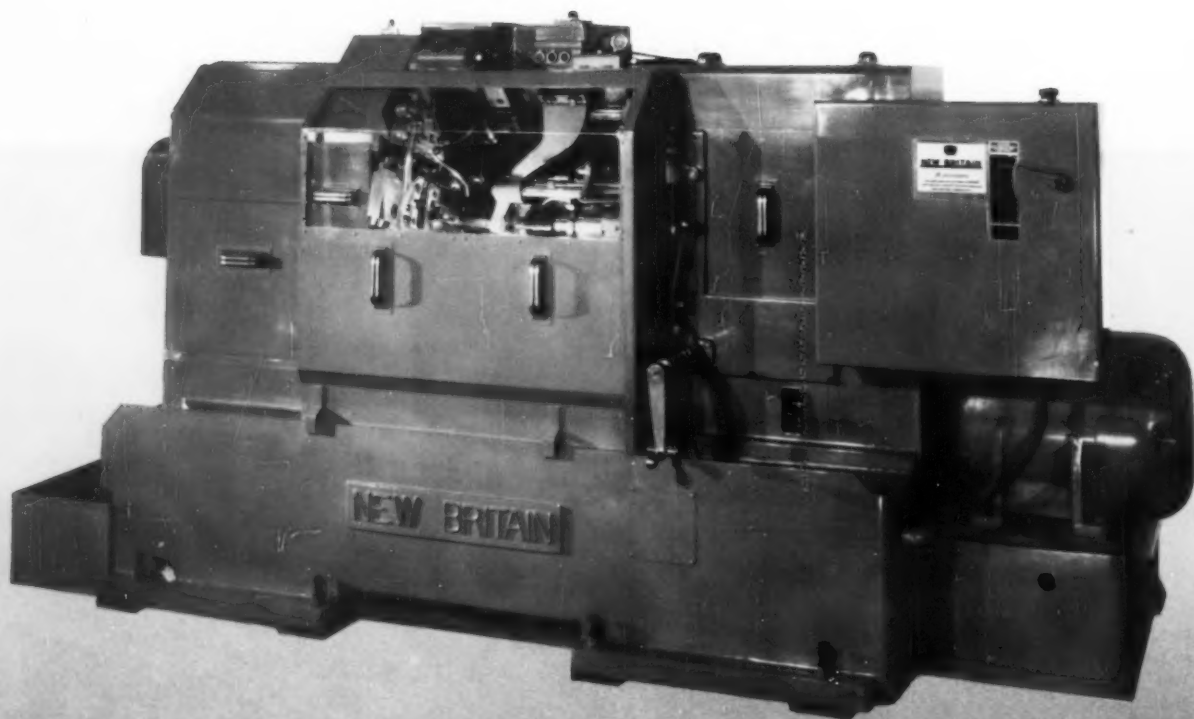
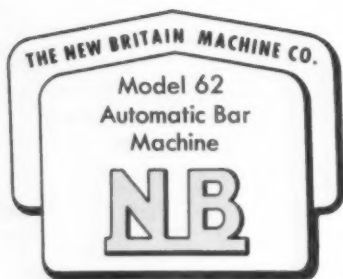
## old methods can't compete

If you do *any* turning you should investigate the New Britain **+GF+** line of copy turning lathes—whether your work calls for sustained production or short runs demanding quick setups. It turns tapers and complicated contours with the same setup used for simple O.D.'s. No need for expensive form tools. Let us demonstrate this completely different approach to turning in a color motion picture demonstration at your desk.



**a long new step forward  
in bar machine productivity**

Here is a new New Britain bar machine with the ruggedness, power, speed and versatility to shed new light on your profit picture. Where you have bar work that now requires more than one machine, it may be practical to eliminate costly finishing operations by doing the whole job on a New Britain Model 62. Ask your New Britain representative or write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.





**Checking  
weakness  
in welds**

**AnSCO Superay "A"  
film spots a  
longitudinal crack  
in a joint**

## **AnSCO watches over quality for industry**

### **THE RIGHT FILM FOR EVERY X-RAY NEED:**

**SUPERAY "A"—**  
Versatile! A "workhorse" film!

**SUPERAY "B"—**  
Resolving power for research!

**SUPERAY "C"—**  
High-speed for production-line  
inspection!

**THE RIGHT CHEMICALS FOR  
PERFECT PROCESSING RESULTS:**  
Liquadol, Liquadol Replenisher, Liquafix

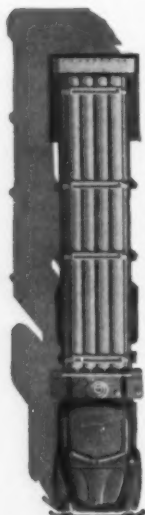
It was exciting to start with—the technique known as radiography! In a scant few years, it revolutionized quality control. But, when AnSCO created the first films tailored especially for industry, X-ray accuracy reached a new pinnacle.

Today, AnSCO Superay "A" film, with its high contrast, can guarantee uniform welding quality right in your shop—swiftly, non-destructively! It can bring you dramatic savings in testing costs, time and labor. It gives you a diagnostic tool as effective as the one long used by medicine.

Are you broadening your use of radiography? Or establishing it for the first time? AnSCO films and chemicals are backed by over a century of skill, by exhaustive chemical research, by experience on a broad variety of accounts (serviced, always, on a personal basis). Let AnSCO watch over *your* quality!

**America's oldest maker of photographic materials... *AnSCO***

April 26, 1956



# IN ADDITION TO **HARSHAW** BORON TRIFLUORIDE HYDROFLUORIC ACID *anhydrous . . . aqueous*

*Here are many more production-controlled, high-quality fluorides:*

Ammonium Bifluoride	Hydrofluoric Acid
Ammonium Fluoborate	Aqueous
Antimony Trifluoride	Hydrofluosilicic Acid
Sublimed	Lead Fluoborate
Barium Fluoride	Metallic Fluoborates
Bismuth Fluoride	Potassium Bifluoride
Boron Trifluoride	Potassium Chromium
Boron Trifluoride	Fluoride
Complexes	Potassium Fluoborate
Chromium Fluoride	Potassium Fluoride
Copper Fluoborate	Potassium Titanium
Fluoboric Acid	Fluoride
Fluorine Cells	Silico Fluorides
Fluorinating Agents	Sodium Fluoborate
Frosting Mixtures	Tin Fluoborate
Hydrofluoric Acid	Zinc Fluoborate
Anhydrous	Zinc Fluoride

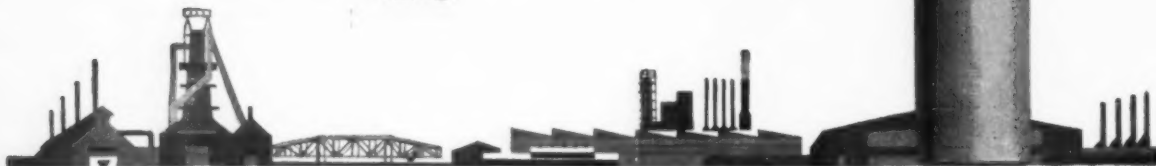
## **THE HARSHAW CHEMICAL CO.**

1945 East 97th Street • Cleveland 6, Ohio

Chicago • Cincinnati • Cleveland • Detroit • Houston  
Los Angeles • Hastings-on-Hudson, N. Y. • Philadelphia  
Pittsburgh

### **WRITE FOR**

Harshaw's 40-page Book  
on Hydrofluoric Acid  
Anhydrous. It provides  
helpful data.



# ? *Are we big enough for a Towmotor?*



***You are!***

Every company is interested in reducing costs, speeding up production or services, making maximum use of storage space. Towmotor equipment will help you achieve all three.

If volume is your goal, Towmotor Fork Lift Trucks can eliminate bottlenecks, help you maintain a steady "flow" of materials. If costs are your problem, Towmotor equipment can save warehouse space, cut operating costs, help you keep your products and services more competitive. To learn how Towmotor equipment can increase your profits, call your nearest Towmotor representative today . . . or write for Job Studies covering *your* industry. TOWMOTOR CORPORATION, Div. 1504-A, 1226 E. 152nd St., Cleveland 10, Ohio.

Read how a maker of metal castings moves 3,000,000 pounds of metal a month.

Ask for Job Study #140

THERE'S ONLY ONE  
FORK LIFT TRUCK  
CALLED TOWMOTOR

America's best engineered fork lift truck

See the TOWMOTOR EXHIBIT



Cleveland Auditorium, June 5-8

**TOWMOTOR**  
THE ONE-MAN-GANG

April 26, 1956

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# Do you really know the alloys you buy?

For instance, are you SURE of:

- **Heat identification** . . . not just type identification but the positive identification of your particular heat so you can be sure the alloy steel is everything it is supposed to be?
- **Chemical analysis** . . . not just the chemical range for the type, but the specific analysis of the heat from which your steel was rolled?
- **Hardenability** . . . not just the average hardenability for the type of alloy, but the actual test-proved hardenability of your particular heat of steel?

If you don't know these important facts, you may be in for trouble—loss of time and money; breakdown of equipment. It can happen when you're not sure of your alloys.

But when you work with Ryerson alloys you *can* be sure—sure of the steel you get, sure of what it will do—because Ryerson alloys are certified by an 8-step quality control program.

Every step has a specific purpose—every step is designed for your protection, but doesn't cost you a dime. For alloys with all questions answered, call your nearby Ryerson plant.

## RYERSON STEEL

### PRINCIPAL PRODUCTS

**CARBON STEEL BARS**—Hot rolled & cold finished

**ALLOYS**—Hot rolled, cold finished, heat treated

**STAINLESS**—Allegheny bars, plates, sheets, tubes, etc.

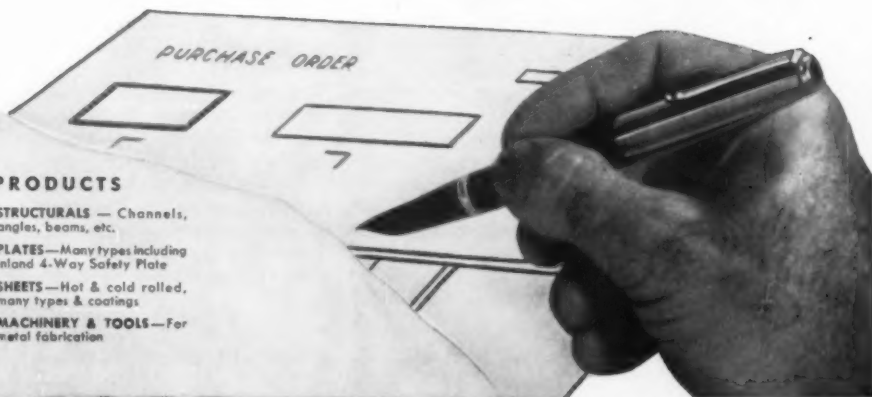
**TUBING**—Seamless & welded, mechanical & boiler tubes

**STRUCTURALS**—Channels, angles, beams, etc.

**PLATES**—Many types including Inland 4-Way Safety Plate

**SHEETS**—Hot & cold rolled, many types & coatings

**MACHINERY & TOOLS**—For metal fabrication



JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

## From Canada: New Coating

A new Canadian metal finishing process is getting a careful checking out from leading U. S. fabricators. It's already used in Canada. Advantages claimed: provides a tough, long-lasting coating, heat resistant to at least 1000°F. Coating can be clear or colored. Backers say it's resistant to most industrial, domestic corrosive atmospheres; has no effect on properties of the metal it protects.

## Higher Hydraulic Pressures

They're hiking hydraulic pressures. Don't overlook the trend if you're planning on new hydraulic equipment. Working pressures of 10,000 psi or so raise no more eyebrows today than 3000 psi did before World War II. And general use of 20,000 psi looks like a reasonable bet for the not-too-distant future.

## Aluminized Army, Maybe?

The plans are now in the talking stage. But if they're translated into blueprints and orders, Army ground forces will very substantially increase their use of aluminum. Backing the change are proponents of greater mobility, lighter equipment.

## Railroads Back Bolts

For some railroad structures, bolts are better than rivets. That's the conclusion of Association of American Railroads researchers, based on long-range study of performance of 2000 high strength bolts on 15 different bridges. Previously, railroad bridge engineers held that bolts capable of developing high clamping action would not stay tight under dynamic loads, because rivets often hadn't. Interim report: bolts still holding tight after 8 years.

## Cadillacs In Workclothes

Industrial trucks aren't cheap. They cost more than Cadillacs in most instances—rate better than the cavalier treatment they're sometimes accorded by operators, less-than-adequate service programs. Improved lubrication alone, advises one major industrial user, can boost truck life

15-20 pct. Further simple suggestion: Let operator "pride of ownership" factor work for you by assigning man permanently to particular truck wherever possible.

## They're Carburizing Under Pressure

Speaking quite literally. Application of pressure to carburizing is a reality and a potentially useful one. Recent Russian tests indicate that pressures of 1 to 9 atmospheres during a conventional carburizing cycle accelerate carbon saturation of the surface layer of the steel under treatment. Net effect: a sharper concentration gradient, increased diffusion.

## Saving Through Standards

Standardization of extrusion die blanks and other die supporting tools, permitting their central manufacture and warehousing, saves a major aluminum company with five widely separated plants some \$325,000 annually. Additional savings, the company reports—though less tangible—are realized from the interplant transfer of finished standard tools to facilitate production planning schedules.

## Navy Tries Explosive Bolts

Navy pilots, with an assist from a new explosive bolt, have dropped a bomb at 840 mph—fastest ever in level flight. The explosive bolt contains a charge. When triggered by the release mechanism, it cuts itself in half to release and eject the bomb. The device is claimed to overcome the tendency of high speed air to keep the bomb against the aircraft after release.

## And Now, A Self Propelled Pipe Plant

A continuous, no-joint pipe-making machine which pulls itself along a trench while it manufactures and lays concrete pipe recently completed a 5-mile section of 30-in. diam pipe in Arizona. Gasoline-engine powered, the unit is fed concrete from a ready-mix truck, distributes it around collapsible aluminum forms which determine the ID, while the machine shapes outside walls. Aluminum forms are later collapsed and withdrawn for reuse.

## pre-planned



**CMP**  
**RESTRICTED SPECIFICATION**  
**COLD ROLLED STRIP STEEL**  
 boosts production, stops slow-downs, reduces die costs, meets feed and speed requirements of automatic equipment.

In estimating production costs, one of the items a metal fabricator takes into account is the cost of steel. As important as this is, it is sometimes good economics to pay more for steel, but pay less in the end for the fabricated part. The cost of down time on expensive forming equipment, the cost of idle labor, the cost of re-processing defective parts, may well exceed the cost of the extras built into restricted specification steel, which will eliminate these unplanned-for costs.

**CMP** restricted specification cold rolled strip steel can be pre-planned to minimize production delays and produce for you the production cost you need. We will welcome the opportunity to explore with you the cost-saving potentials in your manufacturing processes which may be available to you by use of **CMP** restricted specification cold rolled strip steel.

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 SPECIFIC SPECS  
 FOR  
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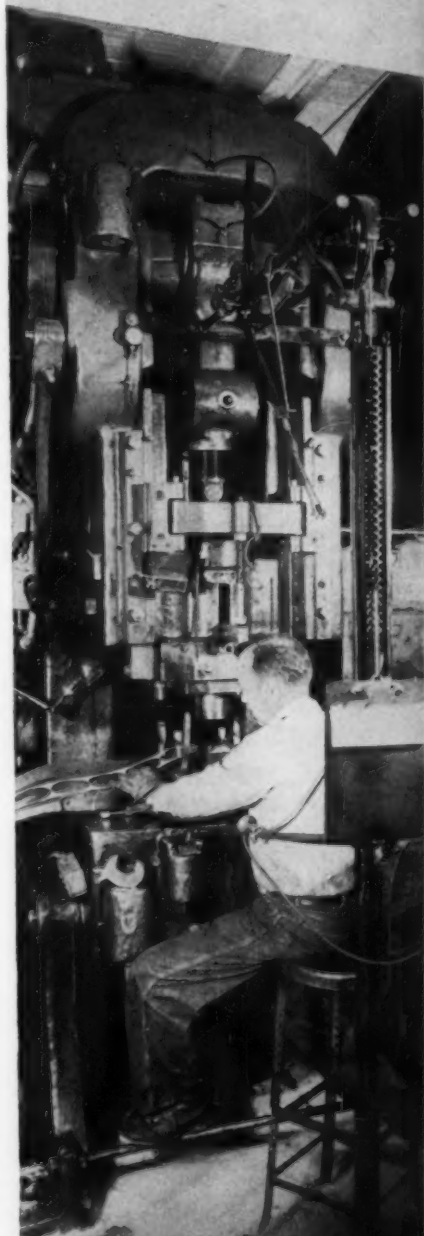
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**STRIP PROVIDES**  
 the precision dimensional and physical qualities that solve many fabrication, cost and performance problems.



## Steel Expansion Sets Off Equipment Boom

**Creating 15 million tons of steel capacity means big business to equipment makers. . . Backlogs have grown, creating a supply problem for expanding steel companies . . . But situation is in hand.**

♦ **AMONG THE ROCKS** and shoals along steel's expansion course is the problem of getting the equipment to make and process the 15 million more tons of steel in the next three to five years.

This potential trouble spot has tended to be obscured by talk of money and markets, which have dominated steel expansion considerations. But makers of heating, blooming, rolling and finishing equipment for steel began feeling the boom last summer.

Now, backlogs have grown, deliveries have been extended, supply pinches have developed. But by gearing for new needs, equipment makers are able to see the way clear to assure the tools for steel expansion.

Current demand is marked by a permanent quality that was missing from old peaks. Mills are doing some long range thinking and suppliers have been encouraged to do some permanent expanding of their own.

Another significant point: Demand is broad-based, taking in nearly every phase of steel production and not just the more profitable operations. Suppliers feel the mills are balancing up their operations to cut costs and fill gaps left by crash programs.

This is the situation as it looks to equipment makers:

### Rolling Mills

Demand for general rolling mill equipment is strong. United Engineering and Foundry Co., Pittsburgh, reports first quarter orders are three times those of the same

period last year. United President G. G. Beard says delivery on a project of any size would probably not be less than one year.

Mr. Beard of United Engineering characterizes the order situation as well balanced. His company has orders for five slabbing and blooming mills and for one revamp job.

Mesta Machine Co., Pittsburgh, has been unable to cut into a backlog that stood at \$91 million the

beginning of this year.

Birdsboro Steel Foundry and Machine Co., Birdsboro, Pa., makers of heavy rolling equipment, anticipates this year's deliveries will be 40 pct above last year's. Backlog is the heaviest in company's history. Capacity is booked solid through the middle of 1957.

### Heating Equipment

"You can't name a type of furnace that someone isn't ordering."

## What Steel Suppliers Say About Delivery:

**Continuous hot mills—"Booked solidly through 1957."**

**Grinding, slitting and machining lines—"Solid through middle of 1957."**

**Slabbing and blooming mills—"Through the middle of next year."**

**Cranes—"Delivery out 18-20 months."**

**Rolling mill bearings—"Year-and-a-half delivery."**

## About Foreign Markets:

**"Business is better than we hoped." "They prefer American work."**

## General:

**"We're supposed to be getting same amount of nickel, but . . ."**

**"We have open capacity. So does everyone else."**

## SPECIAL REPORT

says one manufacturer of heating equipment. Domestic orders of industrial heating equipment rose from \$46 million in 1954 to \$99 million last year. Orders for domestic, fuel-fired, steel mill furnaces came to over \$16 million last year.

Salem-Brosius, Inc., Pittsburgh makers of furnace equipment, has seen backlogs jump from \$3.5 million at the start of 1955 to \$14 million today. A Salem-Brosius spokesman reports delivery of a soaking pit installation would run about 2 years — or six months longer than normal.

On scrap boxes, furnace doors, furnace frames and related equipment, one producer says delivery is being made in reasonable time. On these recurring needs, there has been some tendency on the part of mills to get away from advance ordering. This has made for rush orders but no serious jams are anticipated.

At Bethlehem Steel's Sparrows Point, Md., mill, Arthur G. McKee Co., Cleveland, is designing and constructing a blast furnace nominally rated at 1500 tons per day. This will be completed on schedule, thanks to a large extent to Bethlehem's furnishing most of the steel. Koppers Co., Inc., Pittsburgh, is building a blast furnace for Granite City Steel. Unit is being built on a trestle, will be moved in to replace an older furnace when completed.

About 4-5 other blast furnaces are in the talking stage in the U. S. and 2 more in Canada.

### Materials and Parts

Nickel shortage is the chief supply worry of steel mill equipment makers. They are supposed to be getting as much nickel this year as last but one manufacturer doubts that they are.

Makers of rolls and heating equipment are working hard to cut the nickel content of their products. They have made some headway but not enough to ease matters appreciably. They are asking customers for nickel scrap; they're scroug-

ing around themselves in factory floors and yards.

Structural and plate steel is also a problem, but so far most equipment makers have been able to scramble along without production cutbacks. And they are getting by on their own. Where formerly the mills would specify in orders that steel be bought from them, now just the opposite is true. The equipment man is encouraged to go bother someone else.

Electrical and other components appear reasonably plentiful. Delivery times on forgings, gear and hydraulic pumps range from 4 to 5 months. Nickel chrome castings run about 4 months; heavy plate and structural steel 3 to 4 months. On rolling mill bearings, one producer is quoting 15-18 month delivery.

### Finishing and Coating Lines

Suppliers like Wean Equipment Corp., in Cleveland, specializing in grinding, slitting and machining lines, are booked at capacity through the first half of 1957. Wean has the highest backlog in its 30-year history. The shop is working three shifts with heavy subcontracting. Wean is keeping deliveries current but it's a struggle.

Aetna-Standard Engineering Co., Pittsburgh, which includes finishing equipment and continuous coating lines in its product lines, is quoting into 1958 on orders.

### Engineering

Shortage of engineers and competent shopworkers is a serious bottleneck in northeastern Ohio. One Cleveland company has been forced into making only major design drawings and farming out minor designing.

The Ohio State Employment service listed a current demand for at least 500 engineers in the Cleveland area alone. One Ohio company took on 10 supposedly experienced machinists 2 weeks ago, had to let nine go as incompetent. John Rogers, sales manager at Wean Equipment Corp. says engineering personnel, not shop facilities, are the prime pinch. This is a problem that has no immediate solution.

### Presses

Pressmakers like E. W. Bliss Co., although having their highest backlog in history, are still looking for business. Backlog is about a year of shop capacity on rolling mills but extra shop time is available at the press division if necessary.

### Cranes

With heavy crane makers, deliveries are out to about 18-20 months. If all jobs presently being discussed materialize, deliveries will shortly extend to 26-28 months, according to one builder. Because of larger steelmaking furnaces, spans are reaching out to 80-90 ft on some ladle cranes yet loads are increasing substantially.

Average spans used to be 55-65 ft and loads were seldom more than 400 tons. Competition is hot despite record high output, backlogs and general business volume.

### Expansion

Makers of steel mill equipment appear convinced that the current market is due to stabilize on a high level. Aetna-Standard has just about completed last summer's program for a 40 pct increase in production. Blaw-Knox spent \$17.6 million last year on improvement and expansion. United Engineering and Foundry is still trying to buy the government own plant at New Castle.

E. W. Bliss will complete \$2 million expansion of its rolling mill division at Salem, Ohio, sometime this summer.

Demand promises to stay strong. Steel mills appear to be coming around to the view that steady expansion is a sounder policy than sudden, expensive growth. And each increase in capacity adds to the backlog of future replacement business. One equipment producer estimates 20-year equipment life.

*Reprints: From one to three reprints of this article are available as long as the supply lasts. Write Reader Service Dept., THE IRON AGE, Chestnut & 56th Sts., Philadelphia 39, Pa.*

## SCRAP: Prices Are Acting Up Again

**New price upsurge focuses attention on exports . . . Showdown likely between Commerce and Defense departments over export policy . . . Inflation and high steel production are other factors in latest boom.**

◆ THE LATEST upsurge in scrap prices again focuses attention on the tug-of-war between the Commerce and State Departments over scrap exports. With prices at an all-time high, consumers are becoming restive over the heavy drain of scrap to foreign countries.

Tempers have been mounting for months over the export question. Consumers have been pressing for restrictions on exports as a means of bringing prices into line. Commerce Dept. has been on the side of the mills, but the State Dept. thus far has held the ace cards from the standpoint that the scrap is needed by friendly foreign countries.

Exports are by no means the only cause of higher prices. Sustained high steel production and consequent heavy use of scrap plus the general impact of inflation are other major contributing factors. This despite heavy use of hot metal which is straining blast furnace facilities to the limit.

On the other side of the coin, there are some indications that exports are likely to settle down of their own accord. Some foreign consumers are said to be balking at the high prices of recent weeks. One exporter says he is considering offering pig iron to his overseas customers—if he can get it—since the price of scrap and iron is so close.

### Consumption Record

The mills have been working hard at the job of keeping prices within reason. And despite heavy exports, they managed to keep the lid on until early this year. Prices settled down after reaching an all-time high in early January, but turned upward again in March

and moved to even higher ground. With some exceptions, consumers are still buying as judiciously as possible, moving in and out of the market and avoiding major purchases. They're hoping the situation will ease before any wholesale reduction in blast furnace output is necessary. But the realists admit they're taking a gamble.

Consumption of open market scrap set an all-time high during March, according to Edwin C. Barringer, executive vice president, Institute of Scrap Iron & Steel, Inc. Mills consumed at least 3.4 million gross tons of scrap last month, compared with the previous high of 3.2 million tons in March 1953.

Exports have been a sore spot between consumers and the scrap industry over the past year. The

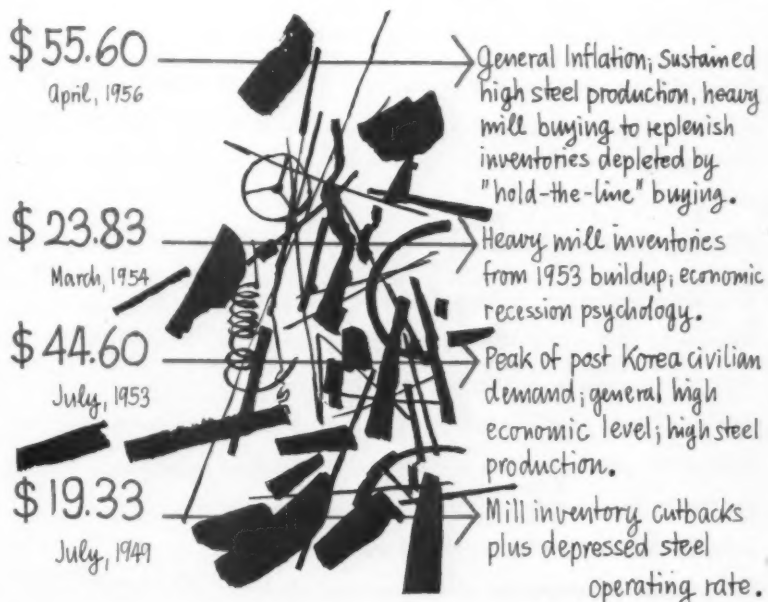
mills argue that a vital strategic material is being dissipated and that further restrictions should be imposed to limit the drain. Scrap people have contended there is plenty of scrap around and ask whether there is any difference between exporting scrap and finished steel.

### Strength In Midwest

If the current price surge continues, the issue may be due for another showdown session in Washington. Thus far, the State Dept. has held the upper hand, but if the Middle East crisis worsens, chances of scrap export restrictions are likely to improve.

Meanwhile, greatest market strength appears to be centered in the Midwest, particularly in Ohio and the Valley.

### What Causes Price Extremes



## LOCATION: What Planned Sites Offer

**Industrial areas are increasing in number . . . Areas planned with transportation and services in mind draw big response . . . Degree of plan varies with site . . . Some offer completed plant and financing.**

♦ **PLANNED INDUSTRIAL** communities are easing many of industry's growing pains by offering new homes to companies in more than 130 different areas.

They offer packages that range from prepared ground to complete new factories. They encourage operations ranging from distribution to a wide variety of manufacturing on sites that offer necessary facilities and frequently nearby markets.

Largely a product of the last 20 years, the organized district is a tract of land laid out and developed for a group of industries. Streets, rail track leads, and utilities are installed before sites are sold to companies.

Concept calls for building restrictions to create and preserve a park-like atmosphere. Buildings must be set back from the street a certain distance. Architectural style is specified. Off-street parking and loading are called for.

### Who's Behind It?

In addition, district planners aim at zoning restrictions that keep nearby industry or homes from jam-

ming up around them. Idea is to have open space, uncongested and pleasant.

Forty pct of the industrial districts in this country are owned by railroads. Private developers own 25 pct; municipalities, 9 pct. Average size of a district is 450 acres; light manufacturing and warehousing are the main occupations.

Most districts have definite rules on the kind of work permitted. In terms of present conditions, a district would probably rule out a basic metals producer but welcome a fabricator or assembler.

Speaking of the Allegheny District near Pittsburgh, John Sykora of the Bessemer and Lake Erie R. R. Co. (owners), said the project was probably best suited to steel satellite industries.

B&LE in its 150 acre district is laying 12,500 ft of lead track, grading away 900,000 cu yd of earth, providing a 500,000 gal reservoir. Companies moving in (General Motors is the first) will find paved streets, all utilities, and country style tax rates.

In addition, the B&LE feels it is

making a very real contribution to the occupant in the planning and negotiating that have gone into the project. This has included finding a site that was handy for good roads and labor pools, exploring such intangibles as community attitude toward industry, and working with county officials in long-range development plans for the surrounding area.

### Builds the Plant

Clearing Industrial District in Chicago goes even further. A private corporation, Clearing offers a package that includes complete design and construction of the plant. A Clearing prospect first gets a rough sketch and a rough cost estimate of his plant. If he's still interested, more detailed plans are prepared.

If there is still interest, the prospect is shown final plans and costs. He can still back out. If he accepts, he is given the opportunity to purchase or lease the plant.

Clearing and other districts also offer financial assistance to companies building or buying new plants. Hayden - Lee Development Co., which operates the Los Angeles Airport Industrial Tract, requires a 20 pct down payment. Balance is payable over a period of 11 years.

Central Manufacturing District, Chicago, provides building maintenance service, has central heating and lighting systems. Same district has a central sprinkler plant for the whole tract. Services are available on a fee basis.

Recreation facilities, banking service, public warehouses are a few of the other features of industrial districts. The term, industrial shopping center, has been applied to the districts. You have all necessary services at close hand but still have plenty of elbow room.

### Planned Industrial Sites Can Provide:

- Prepared highways, railroad sidings and utilities.**
- Adequate space and off-street parking facilities.**
- Attractive sites and specified architecture.**
- Freedom from traffic congestion and transportation problems.**
- Assurance against zoning conflicts and municipal squabbles.**
- Proximity to related industries and possible markets.**
- Labor pools or nearby supply of workers.**
- Long range development of surrounding area.**

## NOISE: Industry's Big Problem Child

Research in many directions is result of industry's awareness that noise is a major problem . . . Damages resulting from hearing injuries mount . . . Research studies how to detect dangerous noises.

◆ **INDUSTRY'S** increasing awareness of noise as an employee and community hazard and potential financial liability is spawning research in many directions, including machine design, noise barriers, and effects of noise on the human ear.

In the process, industry and medical science is learning something about the progressive effects of noise on humans, why one type of noise is harmless, another insidiously dangerous. With an estimated \$2 billion in damage cases hanging over it, industry is faced with a problem akin to that of the famous silicosis and radium compensation claims of the mid-1930's.

### What to Do

Sound-measuring devices are standard equipment in many plants throughout the country; compensation-minded employers are testing the hearing of employees at time of hiring, making further tests of workers exposed to extreme noises. Other machines are used to track down the more dangerous noises (not necessarily the loudest) so that ways can be devised to eliminate or muffle them.

One such machine was announced recently by Mine Safety Appliances Co. Called the MSA Soundscope, the instrument can be used to measure overall plant noise; it can be used to analyze this sound as an octave band analyzer, and can function as a narrow band analyzer. What this means in plain English is that the device breaks down sound into various components so that dangerous noises in the higher frequencies can be traced and dealt with.

What's at stake in the battle to overcome industrial noises? Apart

from public and employee relations aspects, the monetary loss potential is considerable. Some authorities say loss-of-hearing claims could exceed those of silicosis and radium, when many companies were forced into bankruptcy.

### States Have Laws

Some state legislatures have enacted laws to protect workers against disability due to loss of hearing. In New Jersey, compensation claims for occupational loss of hearing filed against a single company amount to more than \$5 million. Benefits in Wisconsin for total loss of hearing are \$12,333 per individual; in Oregon, \$8600; in New Jersey, \$6000.

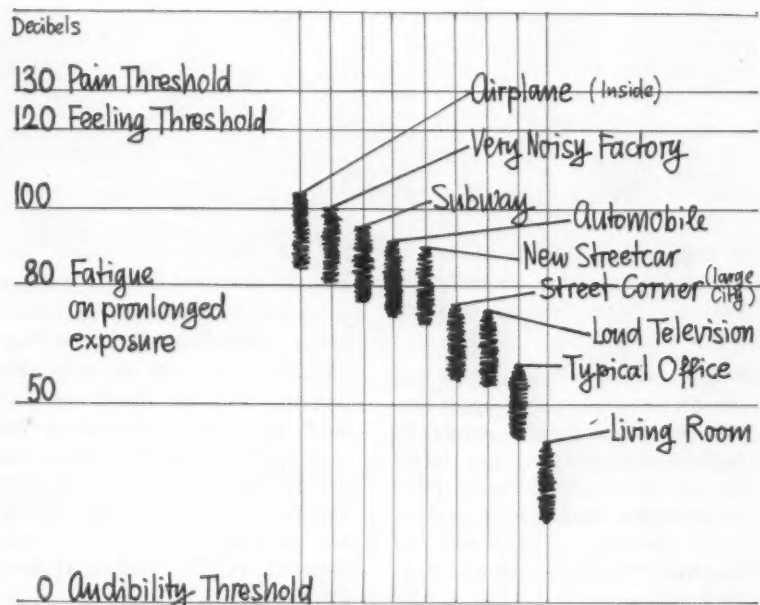
Organized labor has taken up the cudgel. Various unions have taken the lead in lobbying the

state legislatures for more liberal compensation laws, and in aiding workers to press their claims.

In self-defense, industry is attacking the noise problem with every weapon available. Outside consultants are being hired to analyze noisy operations and departments. The battle has extended to the field of machine design. Sound-cushioning devices and barriers are being used effectively. Undercoatings similar to that employed on automobiles are being tried.

An attempt is being made to establish so-called "noise standards." American Standards Assn. is doing work along these lines in an effort to determine amount of noise the human ear can be exposed to without harm. But as yet no definite standards have been published.

### When Noise Starts to Hurt



## LOCKOUT: Industry Hits State Ruling

**Pennsylvania companies join in fight against Pennsylvania decision in Westinghouse strike . . . Millions in unemployment compensation payments at stake . . . Constitutionality issue raised—By G. J. McManus.**

♦ PENNSYLVANIA firms are up in arms over the lockout ruling in the recent Westinghouse strike.

Along with the state chamber of commerce, 72 companies have brought an action to set aside the ruling, hold up unemployment payments based on it, and declare a portion of the state labor act unconstitutional. A smaller group asks simply that payments be stopped until final determination of the issues can be made.

Ruling in question was handed down by John Torquato, secretary of the Pennsylvania Department of Labor and Industry. He held that the Westinghouse stoppage became a lockout on Dec. 27, after the company rejected Governor Leader's proposal for binding arbitration.

On the basis of his finding, 27 claims were approved Feb. 24 by the state employment security bureau. Some 23,000 Westinghouse employees then filed claims. On March 5, the company appealed the 27 awards to the compensation review board.

Shortly after, the group actions were brought. Both seek to block immediate payment on claims. The broader action (72 companies) wants the processing of claims stopped and the basic issues ruled on by the Dauphin County Court of Common Pleas. The companies say the normal course of appeal would entail great expense to the state and Westinghouse in the initial processing of claims.

### The Arguments

Initial hearing (April 12) on this plea brought no decision. Union attorneys, intervening for claimants, argued that the court had no jurisdiction in the matter. Their position was that normal appeal channels provided impartial review and there was no reason for the court to intervene. On the question of impartiality, referees and review board members, while appointed by the governor, acquire civil service status after six months in the job.

The companies reply that the law under which claims would be

refereed is unconstitutional because of its appeal operation. They say also that the ruling in question was manifestly wrong.

Unless the court acts in the matter—and there has been no indication one way or the other—claim proceedings will go forward under referee Libro Taglianetti in Philadelphia. Mr. Taglianetti began hearings on the initial 27 cases April 16. And his decision on the 27 cases will probably apply to the other 23,000.

If this happened there would be nothing barring an injunction to stop immediate payments of claims. Westinghouse could appeal the case to a Superior Court but payments would be made while the appeal was pending and there is no provision for recovery of money if rulings are reversed.

### The Stake

Companies say this procedure deprives them of property without due process of law. They have asked that the sections of the state labor act covering payment during appeal be declared unconstitutional.

Industry payments into the state unemployment fund stand to go up sharply if claims are allowed.

Probably more important to the companies than the money, however, is the effect the ruling could have on future negotiations of union contracts. They say it would establish the principle that the state governor can compel companies to submit to binding arbitration.

They reason this way: The lockout ruling was "arbitrary and capricious." If the governor can call any stoppage a lockout, he can coerce the employer into arbitration by making him contribute to expenses of strikers.

## Why Industry Fights Lockout Ruling

■ Even though Westinghouse is the only company directly involved, Pennsylvania industry has a lot at stake.

■ Industry contributions to the state's unemployment compensation fund are based partly on individual experience and partly on the level of the fund. Peril point of the fund is \$350 million. If the lockout ruling is allowed to stand, it would cost the fund \$9.5 million.

■ Last December, when the amount dropped to \$345 million, a number of companies voluntarily contributed \$5 million. The Attorney General said this payment did not affect the fund level as of Dec. 31 (when the year's rates were set) since the money was not then due. A legal tussle is underway on this point, too. Meanwhile, the fund dropped to \$337 million by Feb. 24, 1956.

## ZINC: The Picture Is Two-sided

**G. H. LeFevre tells institute gathering 1955 was good year for the industry . . . Consumption, production of slab hit million-ton mark for first time . . . But low cost imports keep mines in bad shape.**

◆ **THERE ARE** flies in the ointment. Business is good for the zinc industry in the U. S.—but not in all respects.

G. H. LeFevre, vice president, U. S. Smelting, Refining and Mining Co. painted this two-sided picture before some 300 industry representatives at the 38th annual meeting of the American Zinc Institute in St. Louis.

Mr. LeFevre said consumption of zinc passed the million-ton mark for the first time in 1955—1,079,000 tons. This is 22 pct over 1954. Smelter production kept pace with demand, turning out 1,031,000 tons.

### Mines In Hole

But mine production is another story. Foreign concentrates can be sold in the U. S. well below the price which must be charged for domestic product. This is putting the squeeze on domestic mines. Last year's output, including recovery from slag dumps, was 6 pct higher than 1954. But the total of 504,000 tons of contained zinc is still among the lowest since the depression years.

This has been the trend for the last decade. But the big break came in 1953 when an unusually heavy influx of imports dropped the zinc price and forced many mines in this country to close. Most of these operations are still inactive so that currently more zinc is imported than is mined domestically.

### Consumer Position

This means that consumers are becoming more dependent on foreign suppliers. The big danger according to Mr. LeFevre, is:

"As has been demonstrated in the past in the zinc industry and is being demonstrated today in the

copper industry, at times markets abroad are more attractive to foreign producers than is the United States market, with resulting detriment to American consumers."

The U. S. Smelting, Refining and Mining executive feels the stockpiling program "apparently has not accomplished the maintenance of an adequate industry mobilization base."

### Outlook Healthy

Generally, the zinc industry looks "healthy," primarily because of the increased demand from die casters and continuous galvanizing processors.

The galvanizing industry maintained its position as the nation's major zinc consumer. At the end of last year there were 26 contin-

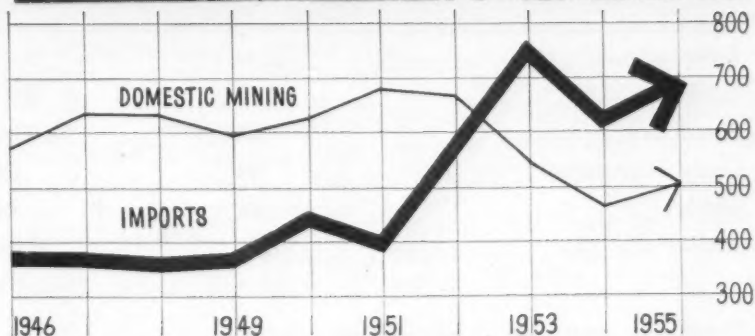
uous galvanizing lines in operation, 2 under construction and 9 or 10 in the planning stage.

### Look to Detroit

Die casting continues to consume zinc at a substantial rate. But since the automotive industry accounts for between 60 and 70 pct of all zinc-base die castings, the continued health of this industry is dependent to a great extent on maintenance of high production levels in Detroit.

Two of the smaller markets for zinc, the brass industry and the rolled zinc industry, both registered advances in the tonnages used in 1955. Although the amount of additional metal required was relatively small, it was substantial percentagewise.

### Zinc Imports Climb



U. S. Steel photo

(Zinc content in thousands of tons)

## METAL POWDER: Uses Are Growing

Industry sees another good year ahead despite dropoff in auto consumption . . . High density materials given edge over small castings and precision moldings . . . Heavy alloys applications—By T. M. Rohan.

♦ IN POWDERED metals, porosity made it possible to produce oil-impregnated, self-lubricating metals for bearings—the first major market and still a substantial one.

But metal powder's biggest new field is in high density materials for structural parts where the crevices are being squeezed smaller through higher compacting pressures up to 60-80 tons per sq in. This is bringing densities of over 6.0 grams per cc and tolerances of 0.0010 in., thus giving them an edge over some small castings and precision moldings. They are now equalling strength of wrought metal and increasing this slightly by infiltration. Heat treatment and nitriding are also developing rapidly.

Some of the new looks in powdered metals were given in Cleveland at the 12th annual meeting and show of the Metal Powder Assn. at which attendance passed last year's record of 800. Morris Boorky, president of Presmet Corp., Worcester, Mass. was elected board

chairman and re-elected president.

Market outlook for the industry this year is good. Despite drop-off in automotive, which is one of the major markets, shipments in the first quarter this year equalled last year, according to R. L. Ziegfeld, New York secretary. The total for this year should about equal last year, making it a moral victory in view of the auto drop. Total shipments of 32,000 tons last year were double 1954 and 16 times 1943, first year for which figures were available. Average size part is about 1 lb compacted on a 3000 ton press.

### Price Comparison

Bulk of the market continues to be in iron powders, 90 pct of which sell at around 12¢ per lb and 10 pct at up to \$1-2 for the carbon powders. Two thirds of the iron powder being used is domestically produced and about a third is imported, principally from Sweden.

Some firms such as International Business Machines, which uses a vast array of small mechanical and

electrical parts, are using up to 500 different powdered metal parts. Athan Stosuy of IBM's Poughkeepsie, N. Y. engineering laboratory told the group that powdered and sintered metals are competing pricewise with other methods of fabrication (other considerations being equal) except simple stampings and screw machine parts on small precision components. They are also improving the product when used in such items as friction clutches, self-lubricated bearings, cams, gears, carbide wear resistant parts, contact points and commutator brushes.

Special properties of powdered metals being utilized in IBM machines are in ferrite cores for electronic data processing machines for memory components where retained strong magnetism is necessary. IBM has also set up a small laboratory for its own development and for short production runs of about 100 parts. About 90 pct of the parts considered favorable as sintered metal eventually are proved successful there.

In extreme density applications, powdered metal is reducing the size of self-winding wrist watches through heavier, smaller counterweights, reducing size of gyros on guided missiles and holding Cobalt 60 in hospitals. This is being accomplished through heavy alloys composed of 90 pct tungsten, 6 pct nickel and 4 pct copper with a theoretical density of 17.2 grams per cc.

J. F. Kuzmick, president of Welded Carbide Tool Co., Inc., Clifton, N. J. said the heavy alloys are manufactured by cold pressing and sintering or hot pressing. Gyro wheels in which the heavy alloys are used are rotated in service at 25,000 rpm and tested at 40,000 rpm with strict uniform density.

### Where Metal Powders Are Used\*

	1954	(Net Tons) 1955
Bearings and parts	20,500	33,100
Friction materials	1,200	2,100
Magnetic cores	900	1,100
Graphite metal brushes	500	850
Lubricants	800	700
Miscellaneous	11,100	19,200
Total	35,000	57,050

\* Includes iron, copper, copper base alloy, lead, and solder powders.  
Source: Metal Powder Assn.

## WELDING: \$1 Million Show

**Fourth annual AWS sponsored show will open in Buffalo on May 9 . . . Expect over million dollars worth of equipment to be shown . . . AWS Spring meeting May 7.**

◆ **YOUNGSTERS** grow faster than anybody.

American Welding Society's annual Welding Show—now a sturdy four-year-old—is no exception. Slated to make its annual appearance in Buffalo May 9 through 11, the exhibit will feature a million dollars' worth of welding gear and accessories including, say show sponsors, hundreds of new products never before shown. (See special welding feature beginning on page 93.) More than 10,000 visitors are expected to attend.

The show is timed to coincide with AWS's annual Spring Meeting, the week of May 7. Meeting sessions will be held at the Hotel Statler. Show will be housed in Buffalo's Memorial Stadium.

The Spring Meeting itself should be quite an event. Sixty-three papers will be presented by

some 120 speakers. Four of this year's sessions are being co-sponsored by American Society of Mechanical Engineers' metals engineering division. Atomic Energy Commission's welding committee co-sponsors another session. And AWS's technical activities committee is offering one session on safety, health and fire prevention.

Supplementing the technical sessions will be a two-day, non-technical conference on welding.

Also planned is an education lecture series for engineering students.

### Big Week Events

Some 750 experts from most leading suppliers of welding equipment and supplies will be on hand at the exhibit to demonstrate equipment under simulated factory conditions.

Other events scheduled for the week include the society's annual business session, installation of officers, a banquet, and the president's reception—the society's outstanding social event.

The first day of the conference will center on maintenance problems. A discussion on "How To Solve Most Welding Problems" will be led by L. D. Richardson, eastern division manager, Eutectic Welding Alloys Corp., Flushing, N. Y. J. J. Jarms, special representative, positioner sales, Harnischfeger Corp., Milwaukee, will be chairman.

The exhibit is one-third larger than the 1955 event, held in Kansas City. There is expected to be more live demonstrations of welding processes than have ever been conducted under one roof before.

## Research:

### Business probes cost of industrial research

How much can a business afford to spend on research? The search for a workable formula goes on. President H. P. Buetow of Minnesota Mining and Manufacturing said at Chicago last week that industrial research expenditures will hit \$5 billion this year; with industry putting up 75 pct of the tab.

Mr. Buetow believes whereof he speaks. Minnesota Mining is expending about 3 pct of its overall sales on research, at its present rate of expenditure will lay out \$11 million for industrial research in 1956, employs 200 in its Central Research Group alone. The 3 pct figure is relatively high. It's fig-

ured that the national average research expenditure is about 1.5 pct of gross sales.

Clevite Corporation, American Cyanamid, and IBM have hit 4 pct. Bendix Aviation has gone as high as 10 pct of total sales expended for research and development.

### Tangible Results

The returns can be measured. One producer of heating equipment has attributed a 10 pct sales growth per year to proper use of new product developments. A group of eight major companies were chosen from the Dow-Jones listings, as those making the greatest research expenditures. The eight companies at the close of March showed a price-earnings ratio of 20-37 pct as compared with 15.3 pct for 30 other firms.

There are other methods of measuring the research return. R. P. Soule, Irving Trust, reports that the pretax rate of return earned on new products in well-managed companies has ranged from 5 to 25 pct of the original investment.

Elgin Watch, with a strong research program in-plant, has nonetheless managed to farm out about one-third of its total research program to outside commercial laboratories, including Battelle, Mellon, and Armour Institutes. As a very rough rule of thumb, Elgin Research Director George Ensign suggests that a cost of \$1200 to \$1500 per month per research worker assigned to the project can be figured in estimating costs of placing research to the outside laboratories.

## VENEZUELA: Metalworking Moves In

**South American country sees its manufacturing plants thrive and expand . . . GM and Chrysler increase assembly operations . . . Ore shipments continue to gain . . . Caracas fastest growing city in S. A.**

◆ A NEW-BORN metalworking industry is flexing its muscles in Venezuela—in an economy traditionally pegged to oil. Oil has worked wonders for the Venezuelan economy, but iron and steel are expected to do even more.

Discovery and development of fabulously-rich iron ore has been a boon to U. S. steel producers, but it has also whetted the appetite of Venezuelans for greater steel capacity to meet the needs of expanding metal fabricating plants.

### Automakers Expand

Numerous U. S. firms have settled in the South American republic. General Motors has expanded its Venezuelan plants 10-fold since 1948. Manufacturer of metal furniture is becoming increasingly important.

Output of nonferrous metal products is of minor importance at present; most of the country's non-ferrous plants employ one or two people. There is increasing demand for aluminum roofing.

General Motors and Chrysler

Corp. are getting the lion's share of the Venezuelan auto market.

GM last year turned out about 16,000 units, double 1954 production. In its last fiscal year, Chrysler produced 6900 units and, with its present expanded facilities, it is turning out cars at a higher rate. GM says that about 75 pct of the company's products sold in Venezuela are assembled there. This is expected to rise to 90 pct when new facilities are in place.

### Ore Exports

This year, it's estimated that around 10 million tons of 63-65 pct Fe content ore will be shipped from newly-developed diggings, compared with about 8.5 million tons of Venezuelan ore shipped to U. S. furnaces last year. Ultimately, average annual tonnage may hit closer to 12 million tons.

The Latin America republic's ore industry on a grand scale goes back to 1948. It was then that exploring U. S. Steel geologists came up with a ferric bonanza at the site of Orinoco Mining Co.'s mine.

### Steel Mill Planned

A smaller deposit at El Pao, containing about 300 million tons of 65 pct ore, was discovered by Bethlehem Steel Co. and developed by its subsidiary, the Iron Mines of Venezuela.

Backstopping the demand is the significant step up in construction of new ports, mass housing, industrial plants, railroads, and tourist resorts. Caracas, fastest growing city on the southern continent, boasts of its ultra-modern skyscrapers and shopping centers.

Such a trend is favored also by abundant reserves of oil, natural gas, coal, manganese, as well as iron. Also, there's a strong hydroelectric potential.

In a drive aimed at greater self-sufficiency is meeting its increased need for finished steel, the government is independently financing a new \$173 million steel plant located less than 100 miles from the U. S. Steel-Bethlehem iron mines.

Initial production on a mill site of 11,250 acres will begin in first quarter, 1958, with full output slated for 1959 at 300,000 tons annually. Later, this will be stepped up to 421,000 tons.

Despite this undertaking, Venezuela, like other South American countries, is still steel-poor. At present she consumes around 600,000 tons a year.

Within the next two or three years, annual consumption will hit about 1 million tons, which means that, despite the new mill, she will actually buy more steel from foreign sources than ever before.

A secondary steel plant, organized in 1948, fabricates reinforcing bars from local scrap for the construction industry. This plant has a reported capacity of somewhat over 16,000 metric tons a year.



INCREASED activity in Venezuelan metalworking, like this Chrysler auto plant in Caracas is putting on pressure for more steel production.

## Saratoga:

World's most powerful  
warship commissioned

Armed with the newest in jet aircraft and guided missiles, the aircraft carrier Saratoga is on its shakedown cruise following commissioning at Brooklyn Navy Yard.

Industry's role in building the world's largest "mobile airfield" was emphasized by Charles S. Thomas, Secretary of the Navy, who pointed out that some 350 major vendors and manufacturers had a part in bringing the "Sara" to life. Over 675 contracts were let. Much of the ship's equipment, including turbines and electronic gear, are of radical new design.

It required over 115 million lb of steel and more than 473 miles of cable. For maintenance purposes, the Saratoga houses nearly 600 machine tools and appliances.

The ship's offensive striking power will be bolstered by a full complement of three types of jet aircraft. The A3D Skywarrior is a medium bomber capable of spanning the continent in 3½ hrs. The A4D Skyhawk is an attack plane which recently set a world speed record. And the F8U Crusader is capable of speeds well beyond the so-called sonic barrier.

### Air-To-Air Missile

Navy and Marine fighter planes can now be armed with a new, deadly air-to-air guided missile, the Sparrow I, powered by a rocket motor to a velocity reaching more than 1500 mph almost immediately upon launching.

Produced at the Sperry Farra-gut Co. plant, a Navy-owned facility at Bristol, Tenn., the weapon is the result of intensive development by Sperry Gyroscope Co., the Navy Bureau of Aeronautics, and the Naval Air Missile Test Center at Point Mugu, Calif.

Pinpoint accuracy is claimed for the big missile, measuring 12 ft in length and weighing about 300 lb. It is guided to its target by a radar beam transmitted from the launching aircraft.

Successful production of the Sparrow I gives the Navy four



SNO-TRAIN is a new Army cargo carrier designed to thrive on rough or snow covered terrain. Built by R. G. LeTourneau, Inc., the huge vehicle, tires are 10 ft high, will be tested this summer in the Arctic.

types of guided missiles; air-to-air, surface-to-air, air-to-surface, and surface-to-surface. James H. Smith, Jr., Assistant Navy Secretary for Air, says his service is equipped to counter enemy attacks with both piloted aircraft and a limited barrage of missiles.

### Metals Allotments

Defense and atomic energy production needs in the July-September quarter will be met by lower quantities of steel, copper, and aluminum than were set aside by the government for second-quarter.

Allotments to prime contractors and builders of specially-designed equipment in the coming period will include 2½ pct less steel and 6 pct less copper and aluminum than in this quarter.

Office of Defense Mobilization, the allocating agency under the Defense Materials System, reveals the following table of allotments for the two quarters:

Material	2nd Q. 1956	3rd Q. 1956
steel	607,333 tons	592,169 tons
copper, copper		
base alloys	54,619,000 lb	52,987,000 lb
aluminum	131,755,000 lb	124,955,000 lb

### Atomic Age Progress

Atomic-age weapons are changing the profile of some of the biggest government procurement pro-

## DEFENSE

grams. This is how the U. S. Navy, for example, is adapting itself to new-style weapons:

Propeller planes are fast giving way to jets, soon will be almost extinct.

Oil-burner ships within the next few years will be scrapped or converted to nuclear-powered ships.

TNT warheads have almost totally been replaced by nuclear warheads.

Shells of all sizes and designs are giving way to guided missiles.

Atmosphere, long considered the boundary of air navigation, now gives way to space, with boundaries unlimited.

### Education Grants

The government's rising concern over the shortage of scientists is indicated in the large (167) number of new grants awarded institutions and individuals this week. The new grants are valued at \$2,068,000 bringing to more than \$26 million the total value of government cash encouragement in support of scientific training.

The grants, which were awarded by the National Science Foundation, are in the fields of chemistry, earth sciences, engineering sciences, mathematical sciences, physics, and natural sciences.

## EXPANSION IN INDUSTRY

### Motors:

#### New GE plant features extensive automation

General Electric Corp., Schenectady, N. Y., has opened a new electric motor plant featuring a highly mechanized production line which the company calls among the most modern in the world.

GE decided to invest about \$7 million in the project because it feels the electric motor market demand will increase about 75 pct by 1965.

New manufacturing processes introduced have speeded up production and reduced hand operations to a mere two. The company claims, however, that increased output will require more rather than fewer workers.

Primary product of the new set-up will be GE's Tri-Clad 55 line. Extensive use is made of roller type conveyors and an overhead suspension system.

Additional flexibility has been achieved by mounting all machines except largest punch presses on movable mounts.

Punching operations are fully automatic. Metal scrap from this operation is collected under the floor and automatically conveyed to a chute and subsequently to a large bucket. When the bucket reaches a pre-specified load, it automatically lifts to a position where the scrap is dumped into a collection vehicle. The bucket then returns to its position on the line. The chute vibrates at set intervals to keep the scrap moving.

All machining operations are accomplished on a single machine in a progressive series of automatically controlled operations.

Finished motors are tested automatically at the end of each line.

Storage banks are arranged in dispenser fashion so that as one unit is removed another slides down to take its place.



MACHINING required by these end shields is accomplished at different stations on same machine. Shaft holes are bored and rough-finished, and bolt holes are bored and tapped. In addition to much greater production speed, the new tools feature better bearing alignment and longer life.

### Newcastle Foundry Sold

The government's huge New Castle, Pa., foundry will soon belong to the Mesta Machine Co. Mesta submitted the high bid to the General Services Administration of \$8 million. United Engineering and Foundry, which has been operating the foundry since it was erected during World War II, was outbid by about \$500,000.

Mesta proposes to pay \$500,000 down and the balance over 20 years.

Two Congressional committees have raised questions about the possible sale of the foundry to United. Either of these committees, or the Department of Justice has the last word on the sale, but GSA says as far as it is concerned, Mesta will be the new owner.

### Expansion Briefs

Bryant Electric Co., subsidiary of Westinghouse Electric Corp., Danielson, Conn.; new fully integrated facilities for manufacture of electrical wiring, switching devices and appliance controls.

Rolled Steel Products Div., Emergency Steel Service Corp., Chicago; new 50,000 sq ft warehouse.

Banner Metals Inc., Los Angeles, Calif.; new 54,000 sq ft plant to house equipment for manufacture of wire and metal conveyor trays, handling equipment and appliance parts; cost about \$300,000.

Nuclear Science & Engineering Corp., subsidiary of Norden-Ketay Corp., Pittsburgh; new laboratory facilities.

Hyster Co., Portland, Ore.; manufacturers of lift equipment; new plant in Danville, Ill.

# B.F. Goodrich



## They'll make shiny new cars out of that "red dirt"

### *A typical example of B. F. Goodrich improvement in rubber*

**T**HAT stream of "red dirt" is iron ore. Giant-size machines, each taking 17-ton bites at a time, unload the ship. But the chunks of ore hit the conveyor belts on the unloader with such force that belts used to last only a season or two. Sometimes there were lumps weighing half a ton or more. The rubber would be cut and the fabric weakened.

Then engineers decided to try B. F. Goodrich cord belts, designed to take smashing blows. Some of them have lasted three years, some four years—three or four times as long as former belts. The belt in the picture is the newest of all. Engineers specified a B. F.

Goodrich cord belt after this experience. It will carry millions of tons, from which will come steel for shiny new cars and thousands of other things.

B. F. Goodrich conveyor belts invariably save money for users because they're engineered for the special jobs to be done. Some kinds of belts stand hot materials, lasting far longer than others ever used to last. Some stand temperatures below zero. Some are made to handle wet, sticky or freezing materials without clogging pulleys. Some types are made especially for food products. Some are made to carry packages and other things up very steep inclines without letting them

slide down. In fact, there's a B. F. Goodrich belt for almost every problem. Belts are made of many kinds of cords and fabrics, many different kinds of rubber compounds.

Call your B. F. Goodrich distributor for more information about any kind of belting, hose or other B. F. Goodrich rubber products. *The B. F. Goodrich Co., Dept. M-601, Akron 18, Ohio.*



# When you make hollow parts . . .

**Start with  
seamless tubing**



**instead  
of bar stock**



## Save steel, machining time!

**W**HEN you make hollow parts from bar stock, you waste time boring the center hole—you waste steel because you have to throw away the chips you bore out. Why not do it the easy, economical way? Start with Timken® seamless tubing. The hole's already there! Finish boring is often the first production step. You cut machining time—get more parts per ton of steel.

With Timken seamless tubing, your machine tools are more productive. Screw machine stations normally used for drilling can be released for other jobs. You get added machine capacity without additional machines.

To make sure you save even *more* steel, our engineers

will study your problem and recommend the most economical tube size for your hollow parts job, guaranteed to clean up to finish dimensions.

You also get the highest internal quality with Timken seamless tubing. The piercing process by which it's made is basically a forging process. Result: a uniform spiral grain flow for greater strength and a refined grain structure which brings out the best quality of the metal. And the Timken Company's rigid control keeps the quality uniform from tube to tube and heat to heat. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

# REPORT TO MANAGEMENT

## What First Quarter Returns Show

Most of the first quarter reports are in. And more than a few show record sales, profits and generally full production.

There are exceptions to this rule, and they are significant. But they don't necessarily detract from the broad conclusion that industry is well into another of its best years.

This is true along most manufacturing lines—from primary metals to heavy manufacturing equipment. Exceptions to the general boom rule (they can hardly be called weak spots) oddly occur in heavy consumers goods, specifically, automotive and farm equipment.

And even within these areas, there is no uniformity. Some have cheerful reports, others less cheerful to downright pessimistic.

## What's the Real Trouble?

Problems of farm equipment and automakers are far different, although both defy the general economic rules.

All evaluations of the farm equipment market, taking out the political, indicate that farmers need more mechanical assistance, should be in the market despite the slump in farm income.

But because the farmer's financial position is no longer controlled by supply and demand, his buying habits defy prediction. And, while this is no place to argue the political angle, both parties are pledged to see that the farmer gets what is commonly called "his fair share of the economic wealth."

It's safe to assume that metalworking's farm markets are not in any permanent slump. The farmer also knows how to play politics, and staying out of the market in an election year could be part of it.

## How Big Do You Have to Be?

Everyone knows that auto sales are well below the rate of last year. But it isn't total sales that cause the trouble. Even with the drop in auto buying, General Motors, Ford, and Chrysler, although to a lesser extent, are doing all right.

But Studebaker-Packard and American Motors situations present a different problem. These companies, which would be giants anywhere else, suffer most in a general sales slide.

The fact that Studebaker-Packard has been unable to raise necessary financing is an indication of the seriousness of the trouble. No one could accuse either of the smaller companies of lack of management skill. Their imagination and enterprise has been terrific.

They appear to be up against the nearly insurmountable problem of size. The amount of capital needed for necessary manufacturing improvements, research and even advertising put a terrific strain on their capital resources. Even the giant GM has had to borrow for expansion. Smaller companies are still determined, but seem less confident than they used to be.

## Straws in the Wind

January and February bookings higher than the record-breaking average of 1955 have been reported by materials handling equipment makers.

Index of orders for industrial equipment and supplies, placed by industrial distributors, shows another increase. February index is 195.9, a gain of 3.2 points over January. And the number of business incorporations in the first quarter of 1956 set a new all-time record.

## INDUSTRIAL BRIEFS

**Hard Bargain . . .** The assets and business of Jaquith Carbide Die Corp., Lynn, Mass., have been purchased by Pratt & Whitney Co., Inc., manufacturers of machine tools, cutting tools and gages.

**Framed . . .** Convair Div., General Dynamics Corp., has been awarded a contract by the Air Force to develop an airframe for a nuclear-powered plane at its Fort Worth, Tex., plant.

**Moving West . . .** A core solder manufacturing facility has been set up at its San Francisco plant by Federated Metals Div., American Smelting and Refining Company. This addition now makes available to western industry the entire line of Federated solder products, locally produced.

**Sandy Selling . . .** Big Sandy Electric & Supply Co., Inc., Pikeville, Ky., has been appointed an authorized Carboly carbide mining tool distributor by Carboly Dept. of General Electric Company, Detroit.

**Live and Learn . . .** Columbia-Southern Chemical Corp. has initiated a new program to stimulate local high school science teachers in acquiring advanced education in their fields. The program will make available summer fellowships toward advanced degrees for the teachers of chemistry, physics and mathematics at a local high school.

**The Hull Story . . .** Ets-Hoskin & Galvan, San Francisco, Calif., has been appointed distributor of magnesium anodes by The Dow Chemical Company. Ets-Hoskin & Galvan will concentrate on the cathodic protection of ship hulls by means of magnesium anodes.

**"X" Marks The Spot . . .** New powerful X-ray installation is in the planning stage at the Chicago Bridge & Iron Co. plant, Birmingham, Ala. The unit will allow radiographic studies of a wide range of metal products from relatively thin fabricators of special alloys to heavy steel castings and weldments.

**Empire State Building . . .** Building plans submitted to the New York State Labor Department for non-residential construction outside New York City in 1955, were about \$37 million higher than 1954. Industrial Commissioner Isador Lubin said that the expansion of industrial and service establishments in suburban areas and counties largely accounted for the increased construction.

**Que Esto? . . .** A Spanish firm has ordered 20 Fruehauf Trailer Company refrigerated truck-trailers, reported to be the first of its kind in Europe. The Spanish firm, General Commissary of Supplies and Transport, Madrid, will use the 35-foot-long trailers to carry frozen foods to various European cities.

**Paper Switch . . .** Westinghouse Electric Corp. announced that its wholly-owned subsidiary, the Times Appliance Co., Inc., will be known as the Westinghouse Appliance Sales Corp., effective immediately. No change in location, or personnel is anticipated.

**Merci . . .** Thermal Research and Engineering Corp., Conshohocken, Pa., has a licensing agreement with Heurtey & Co., French manufacturer of heat equipment, for exchange of technical information; the right to manufacture and to distribute Thermal heating products in the area it now serves.

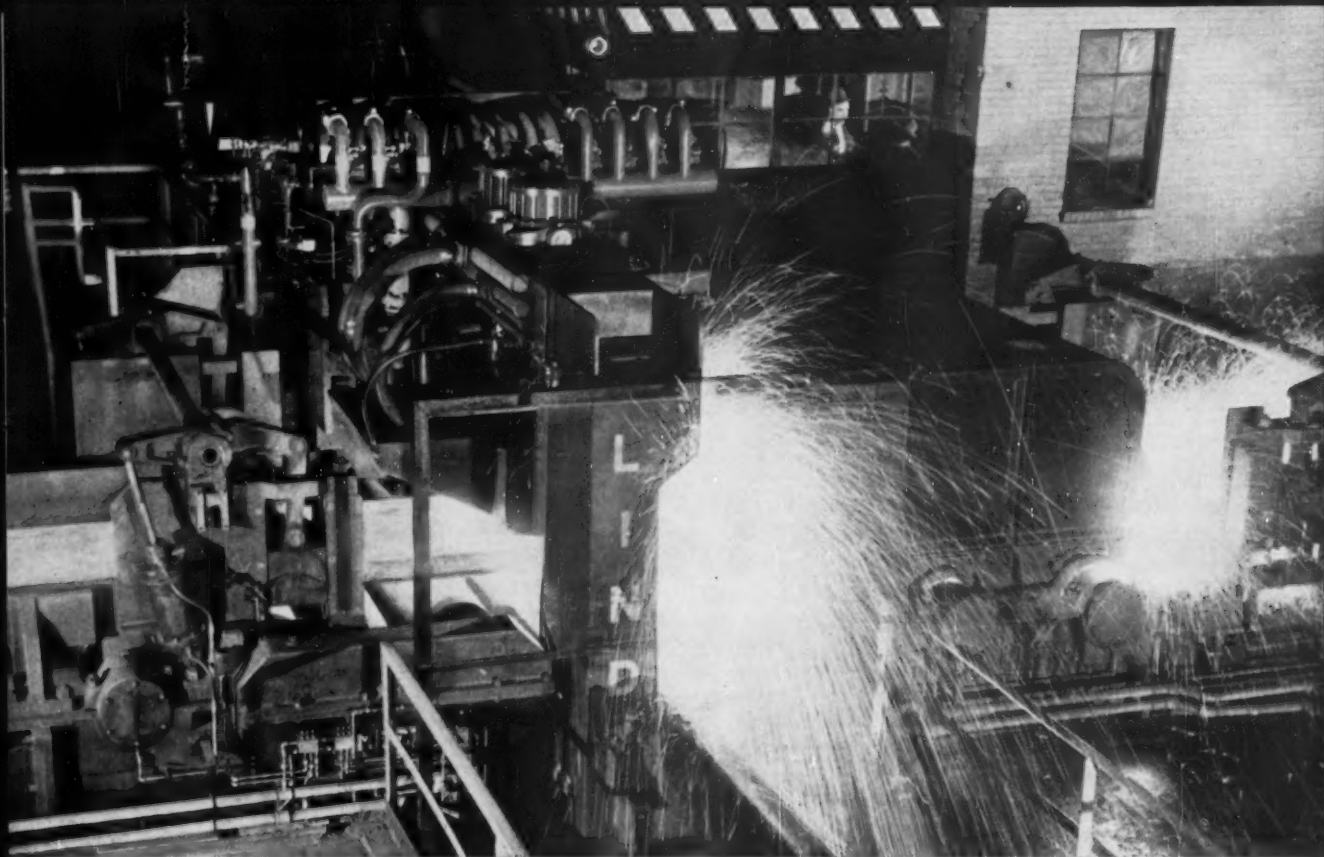
**Horsepower Saver . . .** An electric fan clutch which disengages an automobile engine's fan when it is not needed to cool the engine is now being offered as optional equipment on 1956 model trucks made by one of the big auto makers. Designer and manufacturer is Warner Electric Brake & Clutch Co., Beloit, Wisconsin.

**No Deadline Worry . . .** General Electric Co. has developed a special-purpose high-speed printer capable of turning out more than 2,500 lines per minute. The new electro-magnetic unit, about the size of a shoebox, is designed to print results of numerical calculations by fast analog computers.

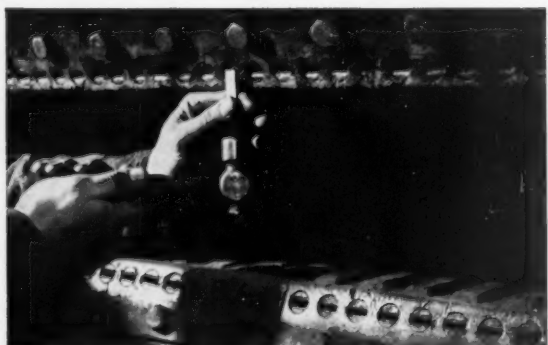
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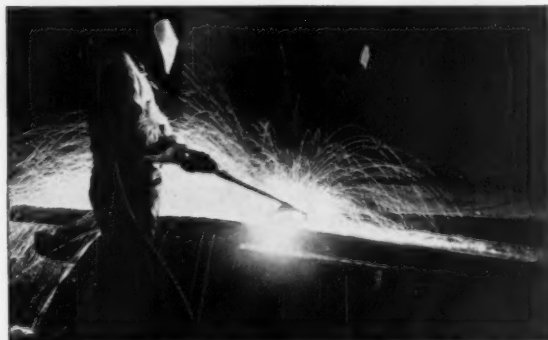
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## How Great Lakes Steel *planes* quality



144 BURNER JETS automatically plane both top and bottom of slabs to remove surface cracks and impurities.



HAND SCARFER double checks slabs to make certain that any flaws extending below surface are also removed.

Just a dramatic picture of a steel mill in action? Far from it! These sizzling-hot sparks tell another very important story about the special care that goes into making steel at Great Lakes.

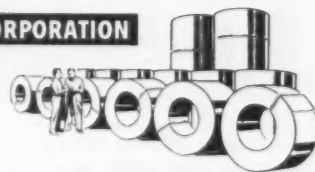
They're bouncing out from beneath the burner jets of the automatic hot scarfing machine. Scarfing? Just as you plane wood to get a smooth, flawless surface, so does the scarfer automatically burn away the top and bottom "skin" from each slab of steel. Then, jets of water sweep the slab clean.

The end result: you get a higher quality, deep-drawing sheet with an inherently flaw-free surface. That's one more important reason why you should call Great Lakes about your steel needs. And remember, Great Lakes customers get what they call for.

### GREAT LAKES STEEL CORPORATION

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## How Free Piston Auto Engine Stacks Up

**Successor to reciprocating engine may be free piston power plant . . . Has fewer disadvantages than gas turbine, needs no strategic materials . . . But there are still unsolved problems—By T. L. Carry.**

♦ ADAPTATION of the free piston engine to an automobile has raised new doubts about the future of the reciprocating engine.

General Motors Corp. will show the new engine at the dedication of its Technical Center next May 15-16.

GM claims many advantages for the engine. It has no crankshaft or connecting rods and fewer moving parts.

The engine, which develops about 250 hp, is described as a Siamese unit. It consists of two parallel cylinders, each containing a set of horizontally opposed pistons. The pistons operate like a fireplace bellows, blowing hot

gases through a pipe to a turbine.

The turbine, connected to a transmission turns the wheels.

**No Materials Problem . . .** The biggest advantage of the free piston engine is the relatively cool (900°F) temperature at which the gases are delivered to the turbine. This eliminates the need for critical materials which is one of the biggest problems in the way of developing the gas turbine.

The principle of the free piston engine has been known to the automobile industry for 30 years. Why, then, has it taken so long for an automaker to construct this type of engine for a car?

Up to this time, the present reciprocating engine has been adequate for the needs of the industry. The need for a new type of powerplant has not been pressing because it has been possible to keep improving the present engine as it became necessary.

**No Unanimity . . .** There are many engineers today who firmly believe that the reciprocating engine will never be completely outmoded. They cite the past improvements that have been made and the future advances that are still possible.

These two factors, plus the proven performance and economy of the present powerplant, will make a company hesitate before it switches completely to a new type of engine.

At the same time, there are those who believe that the time is not far off when a new type of powerplant will be a necessity.

These engineers point out that the law of diminishing returns will obsolete today's engine. In other words, auto manufacturers will reach the point where it is no longer profitable to improve the reciprocating engine because the improvements will not be worth the time and money spent.

**What's Next? . . .** If the latter theory is correct, the gas turbine and the free piston engine are the leading contenders in the replacement field.

Like anything else in the industry, both engines have advantages and disadvantages.

In the case of the gas turbine,



General Motors Photo

GM's free piston engine is used to power the XP-500, first automobile to be built for free piston engine power. The new engine burns almost any type of fuel. Although 30 years old in principle, it has new future.

**RB&W FASTENERS -**

*Strong Point of any assembly*



## **Where the heat's on to lift bolts and nuts out of the ordinary**

**Y**ou won't see these spheroidizing furnaces in many bolt and nut plants. They call for a big investment of money. But to a company that wants to be sure of conditioning metal for the best bolt and nut possible, they're worth it.

In the photo above, you see R. M. Hubley setting up to anneal coils of wire rod to change its structure for the better. Next, he'll hoist the furnace at right, setting it down over the stacked coils. This special equipment makes it possible to accurately control the heating, cooling and the atmospheric conditions inside the housing.

Working with the most modern and complete facilities, RB&W men can bring to bear the full extent of their experience. And experienced they are . . . most have long years of service in the company. Some have followed their fathers' and even grandfathers' footsteps.

It's this combination of equipment, experience and quality control throughout RB&W plants that assures you more quality for your money . . . a reliable source of supply . . . and strong fasteners that never let you down.

Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.



**Plants at:** Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. **Additional sales offices at:** Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco. **Sales agents at:** Milwaukee; New Orleans; Denver; Seattle. **Distributors** from coast to coast.



Wysong No. 1010, capacity 10 gauge mild steel, cutting length 10 feet.

### **Greater Accuracy! Greater Production! Less Maintenance Costs!**

Hi-tensile casting construction gives the necessary weight and mass to Wysong squaring shears. With a tensile strength of 35,000 to 40,000 P.S.I. hi-tensile casting construction can resist the shock and pounding a shear must take. The heavily ribbed table, knife-bar and end frames resist sag or deflection and *maintain accurate alignment*. Because hi-tensile castings absorb vibrations, Wysong shears run quieter and smoother.

#### **Standard features of Wysong shears include:**

- Automatic, compensating holddown. Each foot under individual tension. Compensates for varying thicknesses in metal and permits simultaneous shearing of different thicknesses.
- Ball bearing precision back gauge. Adjusts to .0078 (1/128th) inches.
- Time proven, trouble free, 9-jaw clutch with built in non-repeat unit.
- Straddle mounted gears, run in oil.
- Metal finger guard, mounted on holddown. Does not obstruct view of cutting line.

Wysong shears can be equipped with power operated back gauge, a light gauge, remote control switch, automatic lubrication, extension gauges, and rubber pads for holddown feet. Rake of top blade can be changed for cutting plastics, composition sheets and special metals.

Wysong also builds air power and foot operated squaring shears and bending rolls. See your dealer or write to factory for full information.

*Buy a Wysong... It's miles ahead.*



# **WYSONG**

**Wysong and Miles Company  
Greensboro, N. C.**

## Automotive Production

(U. S. and Canada Combined)

WEEK ENDING	CARS	TRUCKS
APRIL 21, 1956	143,274	26,302
APRIL 14, 1956	147,684	26,994
APRIL 23, 1955	190,888	34,186
APRIL 16, 1955	185,262	32,816

\*Estimated. Source: Ward's Reports

there is the problem of high operating temperatures which call for the use of critical materials. So far, this has made the cost prohibitive.

Two of the problems connected with the free piston engine are stability of operation at low output and the necessity of synchronizing the operation. Although the engine has no connecting rods, the pistons must be connected externally so that their motion will remain symmetrical.

The absence of a fly wheel makes stability a problem. The engine must be so designed so that the pistons, through air compression, are self restoring under all conditions.

Regardless of the problems involved, R. N. Janeway, who heads the Janeway Engineering Co. in Detroit, believes that one or the other or both engines will eventually be used in automobiles.

**Fewer Problems . . .** Mr. Janeway points out that the problems presented by the free piston engine might be more easily surmounted in the immediate future than those involved in the production of the gas turbine. It has no heat exchanger and uses non-critical material.

Inasmuch as both operate on the turbine principle, it is possible that research in their development can be carried on along parallel lines. This, according to Mr. Janeway, could result in adoption of the free piston engine first followed closely by the gas turbine. Ultimately, the gas turbine would be most desirable because it is lighter and essentially simpler mechanically.

As far as fuel for the free piston engine is concerned, it may be possible to use peanut oil but it

is not necessarily the cheapest type available. Chances are that gasoline will still be the major source of fuel because it is the most readily available in large quantities.

**No Fuel Advantage . . .** The free piston engine has no fuel advantage over the gas turbine. If anything, the gas turbine would be less fussy about fuel because it operates through continuous combustion.

Commercial development of either type of engine is still 5 to 10 years away, according to Harlow H. Curtice, GM president. Even then, whichever engine comes first will probably be introduced on a limited basis.

## Financial Plight

The financial plight of the Studebaker-Packard Corp. has placed the Big Three squarely in the middle of a huge dilemma. They don't dare help the company openly and at the same time they don't dare let it go out of business.

The reason for both alternatives is the same. If any of the Big Three companies were to pur-

## AUTOMOTIVE NEWS

chase S-P, as has been rumored, the government would waste no time in preparing an anti-trust suit. But, if Studebaker-Packard were to go out of business, the same thing would happen.

## No Takers

The report that one of the big Three wants to buy S-P seems fantastic. The only company that could possibly do it would be Ford. General Motors wouldn't dare even if it wanted to, which seems unlikely, and Chrysler couldn't afford it.

It is more likely that none of them are interested. Ford is bringing out a new line of cars and neither GM nor Chrysler would have any need for S-P's facilities.

The solution to the problem is not an easy one. Insiders in Detroit believe that the best thing that could be done right now would be for the Big Three to make it easier for Studebaker-Packard to obtain some badly needed new financing.

## THE BULL OF THE WOODS

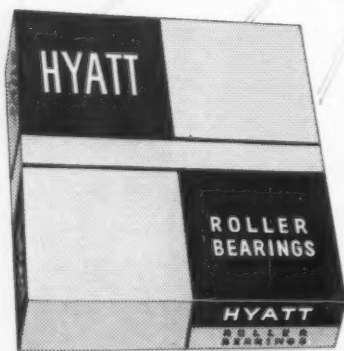
By J. R. Williams



**HYATT HELPS  
FIREBIRD II  
SAVE FUEL!**



**Unique regenerator operates in 1300° F  
exhaust on special HYATT Roller Bearings**



To enable the Firebird II to operate almost as economically as a conventional car, GM engineers designed a drum-type regenerator which revolves through the gas turbine exhaust, recovers 80% of its 1300° F heat, and transfers it to the intake air.

No ordinary bearings, however, could handle this job. So HYATT designed special roller bearings which operate efficiently and dependably in this punishing service. Just as dependably as do the millions of HYATT taper bearings which are used in *nearly half the automobiles being built today!*

Remember, HYATT is America's *first* and *foremost* builder of roller bearings—a major source of supply for the automotive industry. Hyatt Bearings Division of General Motors, Harrison, New Jersey.

# HYATT

**ROLLER BEARINGS**

STRAIGHT 

BARREL 

TAPER 



## Is Nickel Policy Fair to Small Firm?

**Suspicion grows that small companies are shorted . . . Probe could result in trouble for ODM . . . Labor plans anti-like campaign, but goals of fund drive appear to be out of line—By G. H. Baker.**

♦ **JUSTICE DEPT.** evidently suspects there is some reason to believe that the government's methods of distributing scarce materials may be driving small firms out of business. In a firm-toned report to the White House and to the Congress on hard-to-get metals like nickel, the Justice Dept. calls for a prompt investigation of existing patterns of distribution.

Under the Defense Production Act, the Office of Defense Mobilization is authorized to set up systems of allocation for such commodities as aluminum, copper, nickel, steel, cement, helium, and gypsum.

Complaints arriving in congressmen's offices and at the White House indicate that many small users of these metals believe they are being short-changed at the expense of big consumers. Rep. John W. McCormack, D., Mass., says he hears that some large steel companies have surplus nickel, for example, at the same time small users of nickel can only find enough to fill a fraction of their needs.

Quite a few congressmen honestly believe that the present method of allocating metals is making big firms bigger and small firms smaller. If an investigation should show that this is the case, you can expect a major housecleaning at ODM, the government agency responsible for the current allocations and stockpiling policies.

### Nickel Scrap Held

Short supplies of nickel prompt the government to close in with new restrictions on exports of some nickel-containing scrap materials.

During the current quarter, the

U. S. Commerce Dept. will disapprove generally applications for foreign shipment of clean or contaminated nickel-copper alloy scrap, including Monel (Schedule B No. 654502). The department also will disapprove exports of clean or contaminated copper-nickel alloy scrap containing at least 40 pct copper and 5 pct nickel (B No. 644000). Second-quarter applications previously filed for export of these items will be screened in relation to the new curbs.

Prior to the new control action, copper-nickel alloy scrap was included in the quantitative quota for new and old copper-base alloy scrap.

### Aluminum Too

Aluminum scrap licensed for export in the present quarter will be held to 4,000 short tons, down 2,000 tons from the first-quarter quota, as the government seeks to con-

serve much of this material.

New and old aluminum scrap and remelt ingots are included in the second-quarter quota. Primary and secondary aluminum metal and alloys in crude form remain under open-end licensing.

Because of a new change by the U. S. Commerce Dept. in special licensing requirements for aluminum materials, exporters no longer must show evidence of availability to back up their applications to export scrap under quota. But they must show such evidence with applications covering primary and secondary aluminum metal and alloys in crude form.

### Unions Fight GOP

Plant management can expect to see more and more anti-Eisenhower propaganda coming out of union officials' offices in the months ahead. Top AFL-CIO bosses are making it clear they'll launch a campaign

## Why Influence Probe Is Fizzling Out

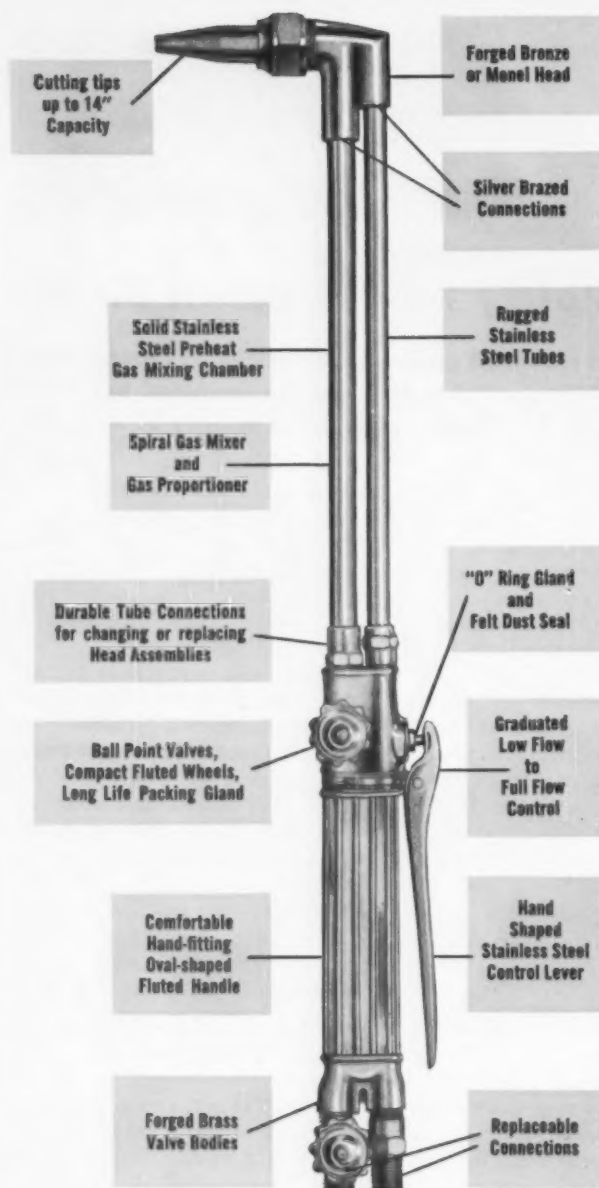
**Leaders of both parties privately admit lobby probe was hastily conceived. Results confined to censuring "Case" case principals.**

**Any new law must not restrict right to petition Congress. Most cases of lobbying are merely organized petitioning.**

**Every major economic group spends healthy sums each year to make sure the facts "as they see them" are known on Capitol Hill.**

**A long investigation would be embarrassing. Most Congressmen have friends registered as lobbyists, many of them have indirectly received campaign donations from them.**

**Lawmakers can't afford to restrict campaign contributions too much when cost of a campaign can run as high as a quarter million dollars.**



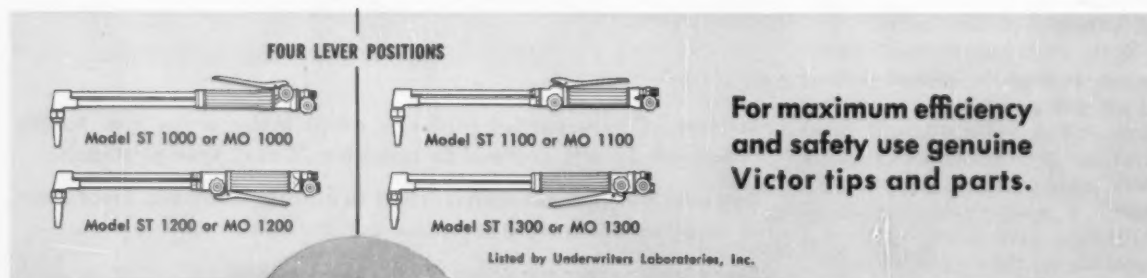
# VICTOR CUTTING TORCHES

Try this torch on your toughest cutting job . . . you'll find it keeps a cool head . . . time tested Victor spiral mixer and gas proportioner assures safe, economical operation.

Note clean lines . . . try its comfortable balance and hand-fitting handle . . . quality construction assures trouble-free performance and ease of repair and replacement of damaged parts.

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Why experiment? Ask your Victor dealer to demonstrate this field-tested, operator approved torch on your hottest, toughest cutting job. Call him NOW.



**For maximum efficiency and safety use genuine Victor tips and parts.**

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Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

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this summer to unseat Ike and to re-elect a Democrat-controlled Congress.

Union chiefs set their 1956 political goals at their annual meeting in Miami Beach in February, and are now spelling out the specific ways and means of gaining these goals.

Although all AFL-CIO members are being urged to "give a buck" to COPE (AFL-CIO Committee on Political Education), union officials privately concede that statistically speaking, only between one and two union members in every 10 actually do kick in a buck.

Total AFL-CIO membership is around 16,000,000, which theoretically is capable of getting up a \$16 million political war chest. (The biggest political nest-egg ever raised was about \$850,000—spent to elect a Democrat-controlled Congress two years ago—and many officials say they'll have to put "a lot of pressure" on the rank and file to build up a political chest of even \$1.5 to \$2 million this summer.)

### Dig for Safety

The only way to beat the deadly ICBM (intercontinental ballistic missile) will be to go underground or have fast and easy access to heavy shelters. This grim advice comes from Val Peterson, the government's leading authority on civil defense.

An ICBM aimed at any big U. S. industrial area would probably be equipped with an atomic warhead capable of totally destroying all life and property within a radius of five miles. In the next five miles of radius, destruction will be "very heavy." In the third five miles, damage would be "moderate," and in the fourth five miles, "light" damage would be sustained.

Warning of an ICBM would not be more than a matter of a few minutes, due to the great speed being developed for these super-missiles. The existing electronic warning systems would only be effective if an enemy chose to send his bombs by the much-slower medium of jet aircraft. Warnings in that case might range up to a couple of hours.

Industrial information leaking

through the Iron Curtain indicates that the Reds are dispersing many of their defense industries, and are locating highly-critical industries in underground sites.

## Welfare Funds:

### Congress plans act to prevent abuses.

Legislation that would force the baring of all details of employee welfare and pension plans is being prepared in Congress, though it is unlikely the measure will go far this year.

It would provide for a federal registration, reporting, and disclosure act, applicable for three years to all welfare and pension programs covering 25 or more employees. Proposing it is a Senate Labor subcommittee which for nearly two years has gathered data on many types of benefit funds.

This group, in a new report, estimates that plans or insurance policies on which the benefit programs are based total about 500,000, with pension fund reserves of \$20 to \$25 billion. Most programs, the subcommittee admits, are conducted "responsibly and honestly."

### Abuses Noted

But the investigation has also produced evidence of squandered funds, illicit administrative methods, and grossly unsound practices in certain benefit operations. The

## WASHINGTON NEWS

lawmakers contend that abuses in the poorly-administered programs will tend to undermine the good reputations of the majority.

Primary control over programs conducted by unions or management or jointly by both would be provided in state laws, even if the recommended registration requirement becomes law. That requirement is defined as a means of identifying the aims and the administrative structures of the plans.

### Who Will Be Boss?

Still undecided is the assignment of the job of carrying out the federal law. Under consideration for the task are the Labor and Health, Education, and Welfare Depts.; Internal Revenue Service; Securities and Exchange Commission; and even a new agency created to take on the work.

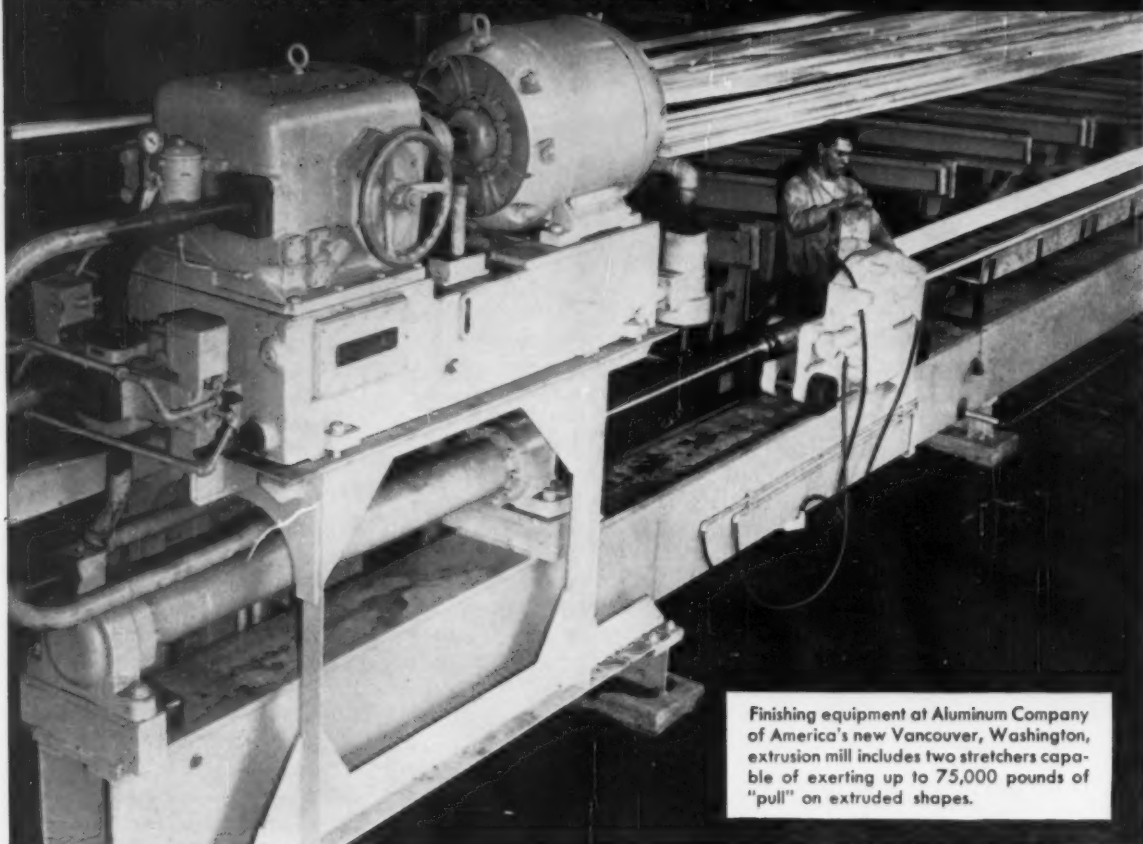
The agency that is made responsible would be empowered to require annual reports from all benefit plans which singly or in conjunction with jointly-established plans affect 100 or more employees. Contained in the reports would be a thorough statement of finances, based on an audit. At its discretion, the administering agency could also require reports from programs covering from 25 to 100 employees.

## Here's the Latest on the "MOON"

- Space satellite will soar much farther into space than was originally planned. Instead of 200-800-mi. altitude, it will make circuit at 1000-1400 mi.
- Launching will be from world's first three-stage rocket, which looks like a rifle cartridge. Dimensions: 72 ft long, weight, 11 tons. Moon will be carried in rocket's nose.
- U. S. will launch its satellite early in 1958, not 1957 as planned. Russia, working on one of its own, says it will have its ready next year.
- U. S. rocket engineers say they'd rather take time and do it right. All major procurements have been let, assembling of "moon" will start in about 12 months.

LEADERS IN INDUSTRIAL SAFETY

ALCOA



One of the things that impresses visitors to Alcoa is the strong emphasis on safety. It isn't surprising, then, to find fire-resistant Pydraul used in Alcoa hydraulic equipment...eliminating a potential source of fire.

## FIRE-RESISTANT PYDRAUL F-9 CHANGES FIRE ZONES TO SAFETY ZONES

275 million hours of actual in-use operation—without a single hydraulic fire—proves the safety and dependability of fire-resistant Pydraul hydraulic fluid.

But Pydraul gives you more than safety. You can be sure of long equipment life with low maintenance... because Pydraul lubricates like a premium petroleum oil. You'll save money on fluid consumption, too! Pydraul is reclaimable—you can return spillage to the system, use it again and again.

Make a quick check of your hydraulic equipment... calculate your fire risk if it's close to hot metal, electrical contacts, open flame or other heat sources. Then talk to a Monsanto representative. He will show you how easy it is to convert to Pydraul... giving you a future of positive safety from hydraulic fires... at low cost per year.

### PYDRAUL MEANS:

Fire Resistance  
Excellent Lubricity  
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No Corrosion  
Re-use, Again and Again

Write now for new booklet, "PYDRAUL F-9." Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Dept. PYD-1, St. Louis, 1, Mo.

**PYDRAUL F-9**—First and Only Hydraulic Fluid Listed by Underwriters' Lab.

On May 31, 1955, Pydraul F-9 became the first fire-resistant hydraulic fluid listed by Underwriters' Laboratories. From the Laboratories' Service Card: "The fire hazard of (PYDRAUL) is rated 2 to 3 in accordance with Underwriters' Laboratories, Inc.'s Standard of Classification in which Ether rates 100, Gasoline rates 90-100, Alcohol (ethyl) rates 60-70, Kerosene (100° F. flash) rates 30-40, and Paraffin oil rates 10-20." See Underwriters' Laboratories, Inc.'s guide No. 540 18, File MH6049.

PYDRAUL: Reg. U. S. Pat. Off.



WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU



## Scarce Minerals Get New Attention

**Pacific Northwest's storehouse of lesser minerals is getting new attention by mining interests . . . Many are needed for wide-range AEC defense program . . . So. California skilled labor shortage is serious—By R. R. Kay.**

◆ **DON'T LOOK** for any 49er-type boom in the Pacific Northwest. However, the mines are really digging. What's shaping up? The less plentiful metallic minerals are coming into their own, the kind that are critical to the Atomic Energy Commission's program and mighty vital to the metalworking industry, too.

People who know say the area isn't over-mineral-rich. But getting active attention today are: chromite, nickel, zirconium. And other Farwest states may soon get into the act turning out thorium and more cobalt and titanium.

**Here's What's Going On . . .** Nickel production in Oregon will rise sharply. Hanna Coal and Ore Corp., with two furnaces at Nickel Mountain, Riddle, Ore., will add two more. Last year's output: 15 million pounds of ferronickel, 6.5 million lb of nickel.

Look for U. S. zirconium production to double when the U. S. Bureau of Mines plant starts up again at Albany, Ore. Capacity: some 300,000 pounds per year of zirconium sponge plus several thousand pounds of hafnium. AEC is looking for a private operator to lease and run the plant.

And these plans sparked Oregon Metallurgical Corp. to break ground nearby for a zirconium and titanium forging and ingot casting plant.

Whiskey Run, Ore., will soon have a chromite production plant. Mineral Sands Co. will turn out ore concentrates using Humphreys spirals, electromagnets, roasting, and acid leaching.

And in the state of Washington, there's much talk about the commercial possibilities of magnesium from olivine via chlorination. Thorium deposits are turning up in Idaho. Geologists say they're "very significant."

There's a lot of interest in Idaho's Valley County. Electric smelting of its ilmenite concentrates shows it's feasible to produce: (1) a slag with over 80 pct  $TiO_2$  for the titanium industry, and (2) a marketable pig iron. That's the word from U. S. Bureau of Mines' Northwest Electro-Development Experiment Station, Albany, Ore.

A chemical separation process for cobalt, claimed to be cheaper than smelting and refining, is in

operation at Garfield, Utah. Howe Sound Co.'s subsidiary, Celerna Mining Co., is also building a pilot plant there to try to produce cobalt electrolytically.

### Labor Market Tight

You don't need a slide rule to prove there's a very tight labor market in southern California. Last Sunday's *Los Angeles Times* carried 19 pages of "Help Wanted" ads. And help is what industry here needs badly.

Convair, San Diego, hopes to add 3000 by year-end to its 25,600 payroll. Biggest need: direct production workers, engineers, and technical people. Behind this shortage are expanding operations in guided missiles, military planes, and commercial transports.

Two other companies, Consolidated Electrodynamics Corp. and ElectroData Corp., are counting on a new TV program to pull in engineers, technicians, and draftsmen. A half-hour Sunday night show features a nonfictional popular science program.

Hughes Aircraft Co., Culver City, Calif., decided it has to train its own. Hughes now has a three-year apprentice training course.

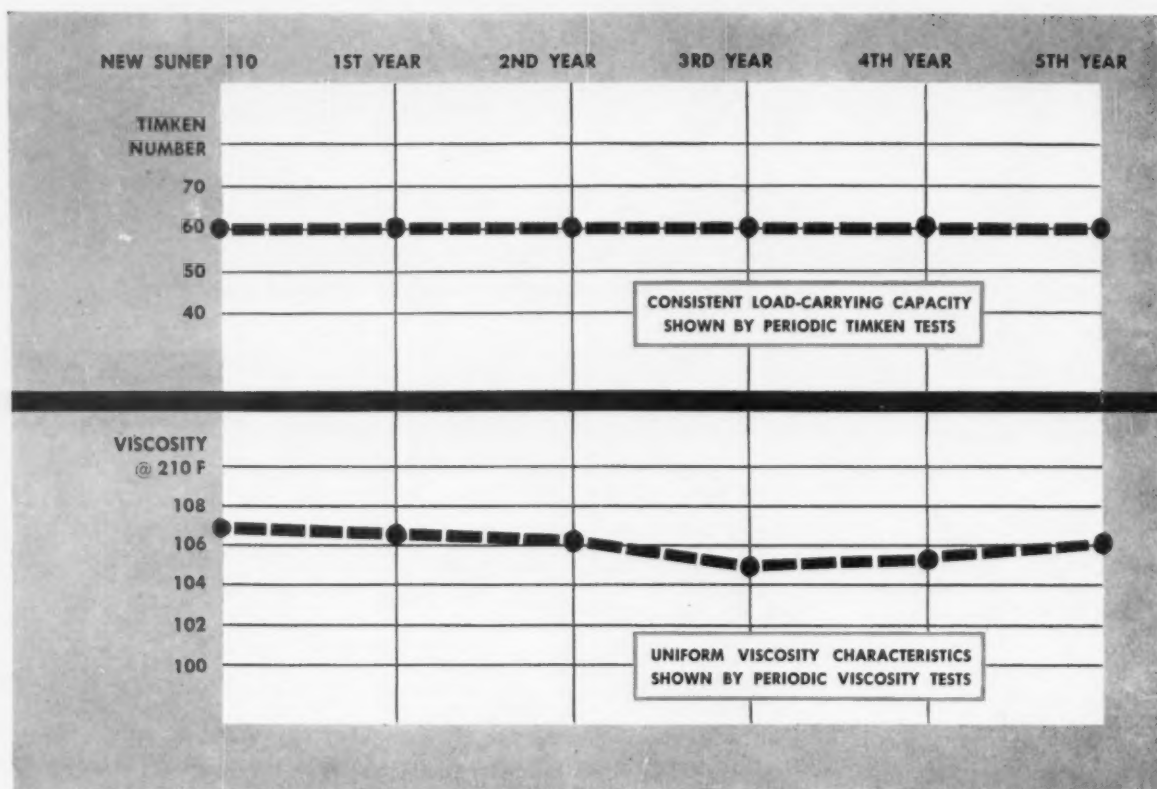
### Expansion Notes

Rome Cable Corp. is adding 24,000 sq ft to its Torrance, Calif., plant . . . New plant gets under-way for Schroeder Tool and Die Co., Van Nuys, Calif. . . . Western Engineering and Mfg. Co., Venice, Calif., is adding more room for production of ventilating equipment . . . Superior Chrome Plating Co., Compton, Calif., is putting up a machine shop.



JOE GENOVESE

"In speaking of my success I must give credit to my wife—I never would have made it without her nagging and insatiable desire for material wealth."



Taken from the records of a major steel producer, the above graphs show the life record of a Sunep gear lubricant used in a 3-stand, 4-high cold-rolling mill. With no make-up, Sunep is as good as new after running more than 30,000 hours.

*Steel company tests show:*

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Sunep® lubricants help cut over-all oil costs because they have a long service life. They are made from high-quality base oils...unusual in the manufacture of extreme-pressure lubricants...and because of this, are outstanding in their resistance to oxidation. They will not thicken or thin out in operation and will separate easily from water. Most important, they will last years longer than ordinary gear lubricants.

Sunep lubricants help keep maintenance down because they don't lose their e.p. qualities. They are specially blended to prevent "fall-out" of the extreme-pressure ingredients in service...a frequent and hidden cause of gear failure.

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INDUSTRIAL PRODUCTS DEPARTMENT

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## MACHINE TOOL HIGH SPOTS

# Numerically Controlled Tools Arrive

Trends in machining and metalforming discussed at Westinghouse forum . . . Numerically controlled tools get boosts from several sources and authorities . . . New developments discussed—By E. J. Egan, Jr.

♦ **NUMERICALLY** controlled machine tools are aiming at the job shop market. Magnetic contactless controls for relaying, amplifying, and switching electrical signals are bringing the promise of relatively trouble-free circuitry to machine tool builders and users.

In-process and post-process corrective gaging will continue to find new applications in an ever-widening segment of the metalworking industry. Work handling systems for individual machine lines will attract new customers as a result of increased versatility and efficiency.

**Trend Established . . .** These are the trends in machining and metalforming. They're not new, perhaps, but they can certainly be more clearly defined than ever before. Each of them received added emphasis by way of new developments revealed at the 20th annual Westinghouse Machine Tool Electrification Forum in Buffalo, N. Y.

Numerically controlled machine tools received a boost from several authorities. One is D. N. Smith, manager of research and development for the Jones & Lamson Machine Co., Springfield, Vt. He said that the firm's decision to produce a punched tape-controlled turret lathe was prompted by two factors.

First was the recognition that "about 75 pct of the metalworking industry is concerned with the production of lots of less than 25 pieces." Second, "the vast majority of machining operations is limited to the production of rectangular forms."

**Improvements . . .** J. & L. has improved the prototype model first demonstrated at the machine tool show in Chicago last September, and expects to have three or four of the new units operating in customers' plants this year.

Mark Morgan, project engineer for International Business Machines Corp., described a digital control setup for milling master cams. The system, developed by IBM engineers, produces cams quickly, accurately and automatically from analytical data. Once the blank is loaded in the fixture and the punched tape is threaded in the reader unit, milling proceeds without any attention from the machine operator.

Mr. Morgan said that the new control reduces setup time and

machining time, and produces more uniform parts. Queried about its complexity and maintenance, he replied that it had operated in a trouble-free manner for several months, and that he did not foresee any difficult maintenance problems.

**More New Stuff . . .** Westinghouse host engineers had some surprises, too, showed machine tool builders marked improvements in the firm's Cypak static controls that were first introduced at the same forum a year ago.

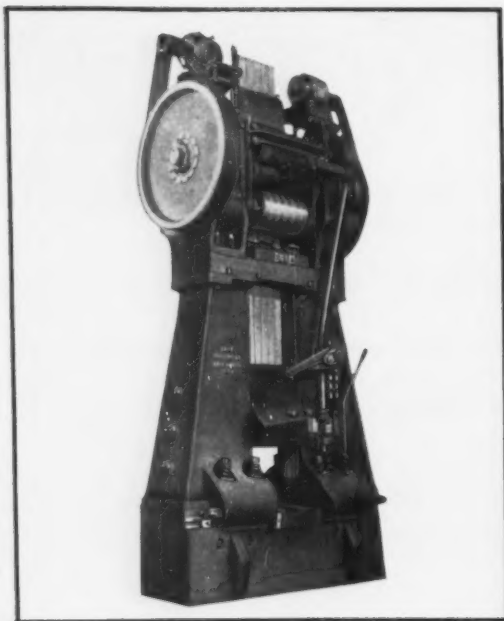
These are the magnetic devices that perform the same step functions as mechanical relays, but which have no moving parts to jam or wear out. Since they were announced last year, they have been used in a number of metal cutting, grinding and pressworking applications. User reactions and opinions helped create last week's Cypak innovation: modular form of the control elements sealed in plastic and redesigned as more efficient plug-in units.

General Motors' experience with these static controls was described by S. F. Newman, senior project engineer in GM's process development section. He said the static controls worked faster, and he believes that static devices in general have the potential to outperform relays.

Initial cost of static controls at present is about one-third more than the cost of conventional relay systems. However, lifetime cost is said to be far less for the magnetic elements because they save downtime.



"How did the men react when you told them I was cutting out the coffee break?"



"Gee, Dad--I bet you forged it in one impression on that big 10,000-lb. Board Drop Hammer!"



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Quiz kid? Mmm, not exactly. It's that Erie Foundry book in his back pocket that did the trick.

What? A forging book for *kids*?

Well you see, we've been thinking that it would be kind of nice to have the youngsters (yours and ours) understand this forging business a little. Might make them think Pop's *almost* the man Superman\* is.

So we poor, unsung fathers at Erie had the exciting story of "Forgeland, U.S.A." put in a book—in the kind of language youngsters understand—with pictures too!

And you're welcome to a copy—or several . . . for free, of course.  
\*absolutely guaranteed to make Pop a hero



**ERIE FOUNDRY CO. ERIE, PA.**

"OUR 61<sup>ST</sup> YEAR"

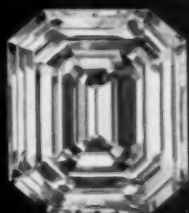
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This is a plain Ruff-L-Buffer after wearing off about one inch in testing operations and then trimming. Loose threads, broken material and numerous small holes due to excessive heat and abrasion of the cloth are apparent.



# 30%

## LONGER BUFF LIFE

The Binderized Ruff-L-Buffer shown here was subjected to the identical test undergone by the untreated buff — yet look at the difference! Notice the absence of thread or cloth breakage of any kind, proof of Binderizing's effect on buff life.



**with H-VW-M Binderized\* Ruff-L-Buffers®**

Not just "another type of buff," but a revolutionary H-VW-M process which impregnates the entire Ruff-L-Buffer with the same organic binder used in buffing compounds. From these "Binderized" Ruff-L-Buffers come a host of practical, cost-cutting advantages, proved over many months in actual production line operations.

Item by item, these are the six major advantages of the H-VW-M Binderized Ruff-L-Buffer.

- **Longer buff life** — damage from overheating eliminated by pre-lubrication of buffing material, preventing excess frictional heat caused by constant flexing. This additional buff life has averaged 30% in actual test runs.
- **Better compound adherence** — the binderizing impregnation creates an affinity between buff and compound. The compound does the cutting, not the buff.
- **Faster cutting action** — more compound is retained on the buff, insuring an even cut for a longer period without re-application of compound.
- **Extended composition life** — additional binder in the cloth ensures better abrasive adhesion, longer life of both composition and buff.
- **Heading-up time** — new wheels require only application of the compound to be ready for immediate operation.
- **Cooler running** — in addition to pre-lubrication, six holes in the center and twelve air channels in the center rim provide a forced air circulation over all cloth surfaces.\*\*

And, of course, Binderized Ruff-L-Buffer retain such important features as *bias-cut cloth* to prevent unravelling, *perfect buff balance* for uniform rotation and wear, and *exclusive Red-E-To-Use face* that takes compound without need for surface preparation.

H-VW-M bias-cut Sisalweev buffing wheels are also available in Binderized types.

\* Patent Pending  
\*\* Patent No. 2,140,208

For complete information on H-VW-M Binderized Ruff-L-Buffers and other specialized buffs write for Bulletin No. B-102.



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INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES



## The Iron Age

# SALUTES

### John J. Chyle

Welding research director and president-elect of the American Welding Society, he literally grew up industrially with welding, and welding with him. He is holder of numerous patents.

In 1924 the University of Wisconsin awarded a Bachelor of Science degree in chemical engineering to John J. Chyle.

In that same year, the form of metal joining called welding was just emerging on the industrial scene as a process which in many cases could improve manufacturing processes and design, and lower costs.

John J. Chyle and welding gained stature together. Today, welding has been perfected to the point where it is a necessary and vital branch of engineering, thanks partly to the significant contributions made by Mr. Chyle.

Currently John J. Chyle is Director of Welding Research for A. O. Smith Corp., Milwaukee, Wis. Next month he will assume the gavel as president of the American Welding Society at its annual convention in Buffalo. This honor is considered a natural culmination in recognition of the tremendous time and talent Mr. Chyle has given the group as member of numerous committees and member of the board

of directors for many years.

Mr. Chyle joined A. O. Smith in 1925 as a chemist in the product laboratory. The following year he was placed in charge of welding electrode research. Twelve years later he was named to his present position.

The success of his work is testified by numerous patents on electrodes and welding processes that have been issued in Mr. Chyle's name. He developed special alloy electrodes for welding high strength steel, used extensively in World War II for production of war equipment. And he participated in work considered essential to production of atomic bombs.

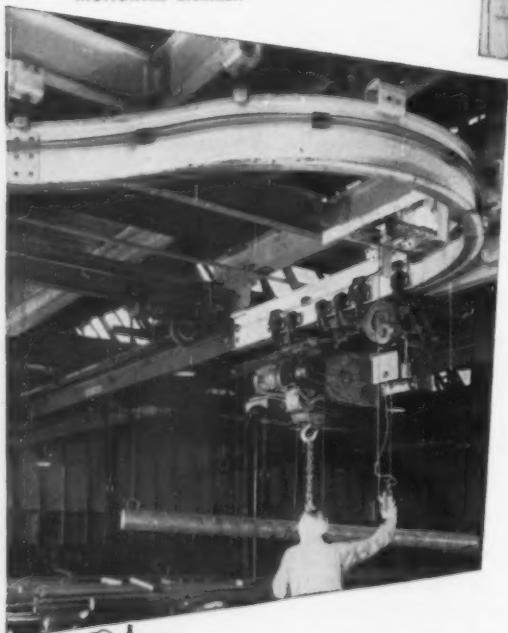
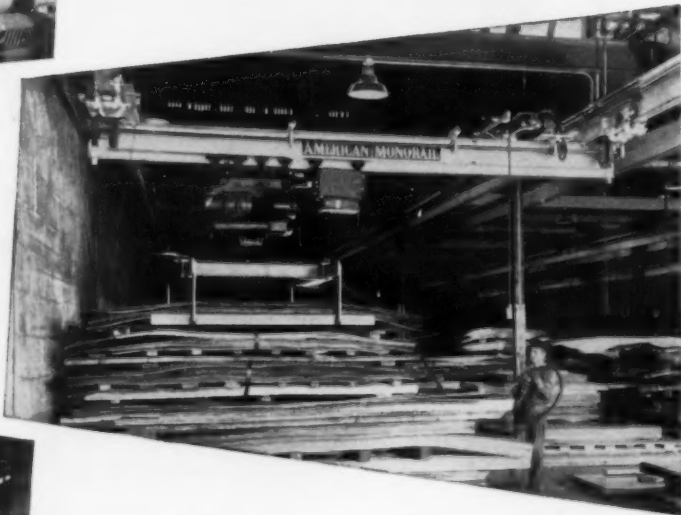
On the wall behind John Chyle's desk is a magnificent 25½ lb trout to which is attached the story of one of his few failures. Mr. Chyle caught the fish in Green Lake, Wis., in 1953. It was the record for that season—until just a day or two before the season ended when a young boy landed a bigger one.



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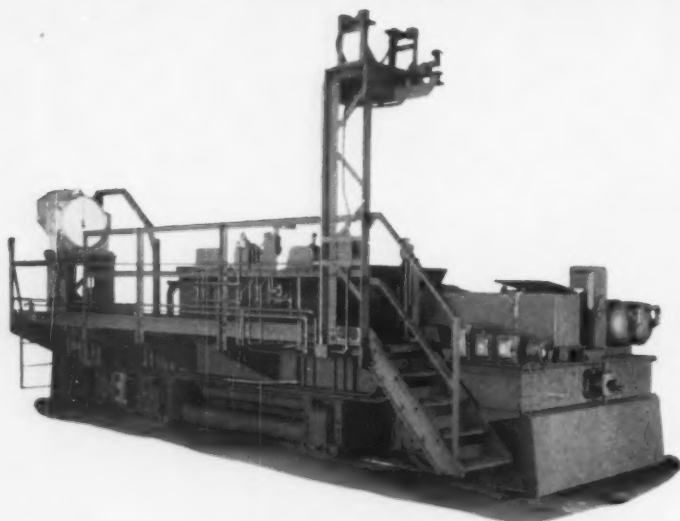
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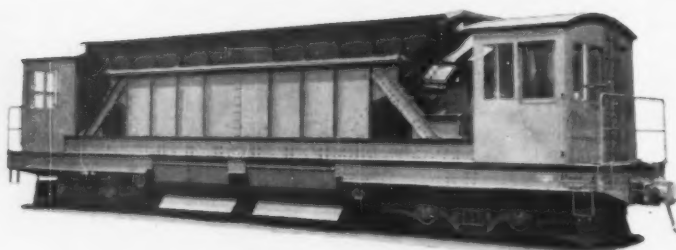
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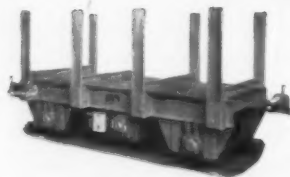


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## OBITUARIES

Guy P. Bible, 74, former vice president, **American Steel Warehouse Assn.**, died April 4 in Daytona Beach, Fla.

Sterling M. Gardner, 70, founder of the **Gardner Electric Manufacturing Co.**, subsidiary of Federal Pacific Electric Co., Emeryville, Calif.

Neill Hutchings, former controller, **Tennessee Coal & Iron Division** of U. S. Steel Corp., died recently in Birmingham, Ala.

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Number 3 of a series

## WELDING



April 26, 1956

## ROD AND ELECTRODE CHARTS

# Processes

Arc Welding

Resistance Welding

Brazing

Gas Welding

♦ WELDING is your best bet. Some one has convinced you of that, or you've convinced yourself. Now you decide whether to weld the assembly in its present form or redesign especially for welding. Either way, you still must face the big problem. Which process will it be?

Before making a selection, you do some thinking about the product. What's the shape? Is the material thick or thin? What's the composition? Can I position it? Must the joint be airtight or watertight? What are the strength requirements? The more questions you answer, the more limitations you place on the selection of a process. But your job is not made any tougher. In fact, it's simplified because many processes already eliminated themselves.

Now you're down to the eight major welding processes. Only four of these account for about 98 pct of all welding done. The other four share the remaining 2 pct. In the number one spot is the arc welding category comprised of about 40 individual processes. However, only four assume large scale importance: manual arc welding, submerged arc welding, tungsten inert-gas-shielded arc welding and metal inter-gas-shielded arc welding. Arc welding generally accounts for about 70 pct of the total.

In order of importance, resistance welding ranks second. The more commonly used processes included in this group are spot, seam,

projection, flash-butt and mash-seam welding. About 19 pct of welding is done by this group.

Third and fourth places are a toss-up between brazing and gas welding. However, if you lump brazing and braze welding together, the nod for third place goes to these two processes by a small margin. In terms of popular usage, the order of ranking is torch, furnace, induction, radiant gas and dip brazing. The remaining four major processes are induction, thermit, forge and flow welding.

## Manual welding dominates

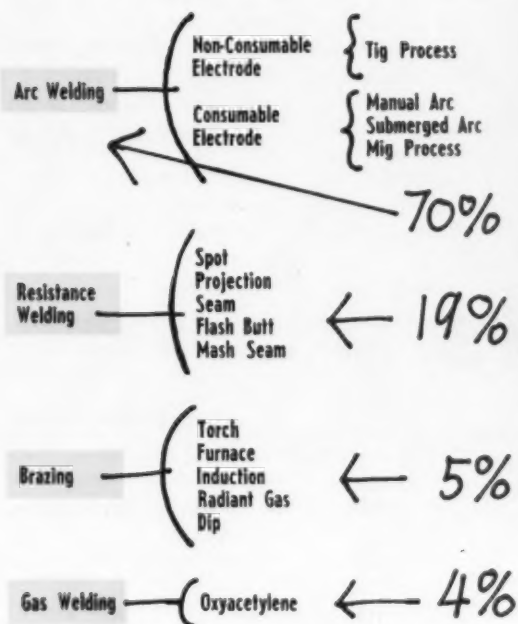
Despite the growth of automation, most arc welding, in fact most welding of any kind, is still done manually. There are good reasons for this, the strongest being the low cost of equipment and the high degree of flexibility.

Equipment for a manual arc welding setup serves as an excellent example. All that's needed is a welding machine, some welding cable, an electrode holder, ground clamp and some electrodes. An operator can start welding on an investment of less than \$1000. With the electrodes on the market, and if the ma-

## ABOUT THE AUTHOR

The editors thank O. T. Barnett who prepared the original material for this special feature. Mr. Barnett is Assistant Manager of Metals Research, Armour Research Foundation, Illinois Institute of Technology, Chicago.

## These Four Major Processes Do Bulk Of Welding



material is at all weldable, chances are that the job can be done by manual arc welding. Keep in mind, though, that labor and cleaning costs may jack the relative unit cost upward if the operation is repetitive.

The big field of usage for submerged arc welding is on carbon and stainless steels. High travel speeds, permissible by high deposition rates, make it an economical process with either a fully automatic or semiautomatic set-up. You'll find equipment costs somewhat higher than for manual arc welding, but these are offset by the extremely low labor costs per unit of weld. New techniques, using two filler rods, drive costs down even more. Cleaning, too, is almost negligible. One of its major drawbacks, however, is the difficulty or impossibility of welding in out-of-position locations. Some attention must also be given to the quality of steel used.

Inert-gas shielded-arc processes are others that warrant your study. Introduced for welding magnesium, they've now extended themselves to many nonferrous metals as well as light gages of stainless and carbon steels. Both the consumable and non-consumable methods produce excellent welds, but the major drawback to greater popularity has been the fairly high cost of the shielding gases—helium and argon. In fact, this provided the stimulus to search for less expensive shielding gases which led to CO<sub>2</sub> welding.



MANUAL arc welding is still the workhorse for joining metals because of its high flexibility.

In selecting a process, don't bypass resistance welding, particularly if your work is highly repetitive. Equipment costs may run anywhere from four to seven figures, but these shouldn't scare you off. The payoff comes with consistently uniform welds of good quality and low weld unit cost. Unit cost drops still further as the work load gets heavier.

Of the eight recognized brazing methods, only five are used extensively enough to assume importance. The essential difference between any two of these lies in the heat source. Torch brazing ranks first in usage. Equipment requirements for this process are so modest that an outlay of less than \$100 is enough to get started.

Furnace and induction heat are also quite common. Both methods speed brazing and improve uniformity. Both can be carried out in a protective atmosphere although induction brazing is most frequently done with a flux. Radiant gas burners, tied in with an automated jig or fixture, also do an effective and fast brazing job. If your parts are such as to require uniform heating to control warpage, consider dipping them in a molten salt bath.

Perhaps your need for welding equipment isn't for the production line. If it's only an occasional job where speed is not essential, you're a good prospect for the oxyacetylene torch salesman. Less than \$200 will get you the most versatile of all welding tools.

# Materials

Carbon Steels

Austenitic Stainless

Cast Iron

Aluminum

Copper-Base Alloys

Nickel-Base Alloys

♦ MOST WELDING processes work very well on ferrous base metals and alloys. But differences in cost and weld quality will dictate your choice of the best process for a particular job.

In welding carbon steels, for example, economic factors rule almost exclusively. Here, part design and weld length are the governing forces.

You'll find most carbon steel welding done with the shielded metal arc process using coated electrodes. Reasons for this are the large number of small welds in terms of length of run, as well as field welding not always suitable to automatic processes.

Submerged arc welding is the second most popular way to weld carbon steels and always is the first choice whenever a free choice can be made. Shop welding, that permits jiggling and fixturing, where weld runs are long, and the plate thick, are increasingly being made with the submerged arc process.

Multiple filler wires and I<sup>2</sup>R techniques are speeding up submerged arc welding. Two tandem filler wires greatly increase welding speeds for applications such as groove welds and horizontal fillet welds. For surfacing, two side by side filler wires permit greater surface coverage per unit of time. I<sup>2</sup>R welding techniques depend upon a controlled length of filler wire between the power input contact and the arc. The resistance of this length of wire preheats the wire before it reaches the arc.

Resistance welding works very well with carbon steels. It is used for lighter gage material in a great many applications. While shielded metal arc welding calls for considerable manual skill and submerged arc welding requires some operator skill, resistance welding can be set up so that thousands of excellent welds are made by the most unskilled operators.

Brazing is also used to join carbon steels where automation can be brought into the picture. Copper brazing and similar brazing processes are the most economical with carbon steel although considerable braze welding is done. The latter is the more expensive way of brazing.

## New processes take over

Gas welding of carbon steels is restricted mostly to very thin materials. Even this application is largely being set aside by Tig welding. Tig and Mig are becoming common abbreviations for inert-gas shielded arc welding processes. Tig stands for tungsten-arc inert-gas non-consumable electrode process, while Mig means metal-arc inert-gas (consumable electrode) process.

So far the carbon steels do not show a significant number of applications for inert-gas shielded arc welding. But recent advances in CO<sub>2</sub> shielded metal-arc welding show the possibility of this process competing very well with submerged arc welding.

Austenitic stainless steels can be joined by

practically all welding processes. Where long continuous welds are made, the shielded metal arc process has lost ground substantially to both the Tig and Mig welding methods. Submerged arc welding found only limited use with stainless steels primarily because fluxes available were not entirely satisfactory. Recent improvements, however, have changed this picture. Submerged arc welding is now one of the more important methods for welding austenitic stainless steels. Where the choice formerly favored the inert gas-shielded processes from a quality standpoint, basic economic factors are now favoring the submerged arc process.

#### **Flux stainless well in brazing**

Resistance welding of austenitic stainless steels is accomplished quite readily. Brazing is another satisfactory process although care must be exercised to make sure that the flux is suitable. Chrome oxide on stainless steels offers a definite hindrance to brazing but can be overcome with suitable materials.

Welding of austenitic stainless steel by oxy-acetylene welding assumes relatively minor importance except where very thin materials are used. Even here, Tig welding has usurped the place normally occupied by gas welding.

Cast iron can be welded by a number of processes. But gas welding and braze welding are considered most suitable while both metal arc and Tig welding are satisfactory. Difficulties with other processes are largely metallurgical. Cast iron must be preheated very carefully, then allowed to cool slowly to minimize setting up stress conditions. The slower heat input of gas welding and braze welding tends to prevent hardening and subsequent fracture of the brittle, heat-affected zone when subjected to stress.

There are probably more different types of welding rods and electrodes for joining cast iron than for joining any other engineering material. These filler metals range from cast iron composition, unalloyed and alloyed alike, through steel, nickel, monel, brass, bronze and aluminum bronze compositions. Skill and experience are necessary in the welding of cast iron.

Aluminum and its alloys can be joined by a number of different processes. Earlier, two major difficulties had to be overcome. First, the aluminum oxide, which did such an excellent job of protecting aluminum from further oxidation, was a stubborn obstacle to overcome. Also, many welding processes required fluxes. These were extremely corrosive and had to be completely removed from the aluminum parts to prevent subsequent corrosive failure.

Resistance welding holds a dominant position in joining aluminum. This is probably because aluminum had its widest early acceptance in



(Photo from Liquid Carbonic Corp.)

**TIG WELDING** setup uses CO<sub>2</sub> to back up more expensive argon. Savings on gas are 70 pct.

the aircraft field and resistance welding methods were soon perfected. Careful cleaning and precise control of current and pressure are essential to good resistance welds in aluminum.

When the Tig process for welding magnesium was perfected during World War II, it was soon tried on aluminum. This tungsten-arc inert-gas process quickly revolutionized aluminum arc welding. It requires no flux since the arc breaks up the oxide film and the inert gas shields the clean base metal from further oxidation. Aluminum arc welding thus changed from a rather difficult process to one that was amazingly easy and produced welds of extraordinary quality.

#### **Mig process thrives on aluminum**

Later, the Mig process, using aluminum filler metal, proved even more acceptable than the Tig process for aluminum weldments. There was sometimes a tendency in the Tig process to touch the tungsten electrode to the work with resultant tungsten inclusions in the deposited weld metal. These appeared to be deleterious on weldments subjected to radiographic examination. The Mig process, using a filler wire surrounded by an inert gas, permits welding in all positions and brings about great increases in welding speed.

Current practice generally uses the Tig welding process for aluminum thicknesses ranging from 1/16 to 1/4 in. Using the Tig method for

butt welding against a cold back-up bar,  $\frac{1}{4}$  in. thick aluminum can be welded at the rate of 5 in. per min. The Mig process, however, increases welding speed to 12 to 24 in. per min. The range of Mig welding thicknesses commonly encountered is  $\frac{3}{16}$  to  $\frac{1}{2}$  in. although both processes are used to join material as thick as 4 in. Distortion, cracking and similar welding problems have been minimized by the high heat input. Good welding speeds have also been made possible with the inert-gas shielded-arc processes.

When brazing aluminum and its alloys, one of the most important problems is to maintain precise temperature control. This is one reason why dip brazing, in which the bath is composed of molten brazing flux, is one of the most important methods for joining aluminum.

### **Stress cleaning after brazing**

Careful cleaning of parts after brazing is extremely important. Once again, the brazing flux is corrosive to the base metal. This necessitates meticulous care in post-braze cleaning. Most brazing filler metals are apt to be less corrosion resistant than the base metal, and in corrosive environments this factor must be taken into consideration.

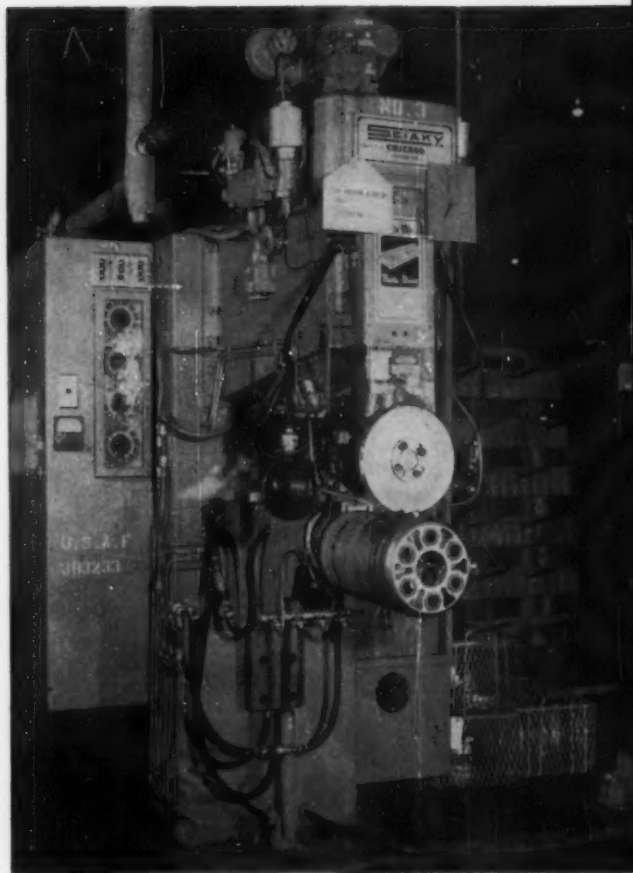
Shielded metal-arc welding of aluminum-base alloys is now practiced very seldom. Difficulty here is the great heat conductivity of the base metal; the fact that the metal does not change color as it becomes hotter; and the presence of an extremely corrosive flux residue—which must be cleaned away to prevent subsequent base metal damage.

From an economic standpoint, gas welding of aluminum and its alloys is declining. The usual fluxing problems and the difficulties of getting sufficient heat into the joint because of the extreme heat conductivity of aluminum are problems similar to those encountered in metal arc welding with coated electrodes.

So far, submerged arc welding has not been satisfactory for aluminum. But if a suitable flux is developed, it may begin to make inroads on the Tig and Mig methods, which are so strongly entrenched in aluminum applications.

While the inert-gas shielded arc processes make welding of aluminum considerably easier, they very nearly revolutionized the welding of copper-base alloys. These materials have always been difficult to join because of rapid heat conductivity; the possibility of making porous welds; and the additional problem of overcoming hot-short characteristics common to many copper-base alloys.

Welding of copper and copper-base alloys is summarized in Table II. The Tig and Mig processes appear to be the best for welding copper alloys. Brazing is also very satisfactory. Gas welding, extremely popular before inert-gas shielded-arc welding, has now fallen



(Photo from Ford Motor Co.)

**QUALITY WELDS** are the important products from this resistance seam welder.

far behind, not because of any technical limitations but because the other processes are more rapid and produce welds of excellent quality. Moreover, the possibility of flux inclusions is no longer a problem.

### **High conductivity hinders copper welding**

Shielded metal-arc welding works well on many copper-base alloys but is not widely used. Likewise, submerged arc welding works very well on the copper-silicon alloys (silicon bronzes), and on the copper-aluminum alloys (aluminum bronzes). Resistance welding varies in its application, being generally unsatisfactory for copper while it works better as the resistance of copper alloys increases—just as the welding processes using filler metal usually work better as the heat conductivity of the copper alloys becomes less.

In general, there is a preference for deoxidized and oxygen-free coppers when pure (or relatively pure) copper is joined by any of the processes listed. Tig and Mig welding or brazing work very nicely, while gas weld-

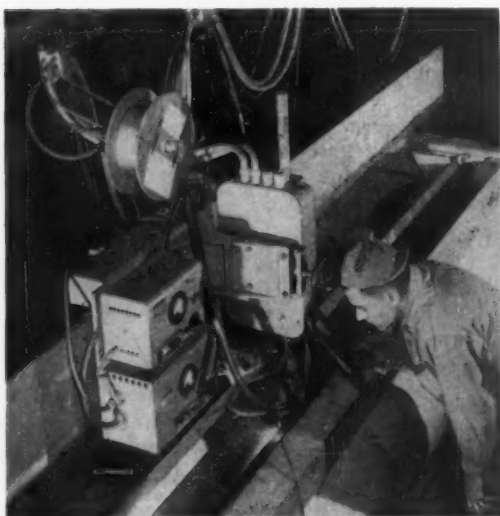
ing is also used. In heavier sections where heat is carried away very rapidly from the joint, gas heating torches supplement the Tig and Mig processes to assure adequate heat input into the joint. While resistance welding is unsatisfactory for copper, there are certain techniques and conditions under which spot welding can be done. It is difficult at best, however, and therefore in over-all evaluation resistance welding has been listed as unsatisfactory.

### Cu-Si alloys weld easily

Copper-zinc alloys, or brasses, vary in their response to welding. For example, the resistance welding of the low brasses is difficult while the high brasses, containing appreciably more zinc, can be resistance welded more easily. On the other hand, the high zinc content of the high brasses causes some difficulty with the arc welding processes due to volatilization of the zinc.

Copper-silicon alloys (silicon bronzes) are quite readily welded by practically all joining processes. Here again, these materials have more normal heat conductivity and behave generally in a fashion similar to ferrous materials. However, the material is somewhat hot-short and under conditions where stresses cannot be accommodated quite readily, cracking may occur.

The copper-tin alloys, or phosphor bronzes, work better with the Mig process than with the Tig and perform quite well for both resistance welding and brazing. Although these processes are the more popular ones, most other welding methods are suitable for phosphor bronzes. The joining of phosphor bronzes creates no particular problems.



(Photo from Linde Air Products Co.)

**MIG WELDER** turns out smooth, porous-free seam welds on this cylinder. Argon offers protection. Welding speed is high; downtime low.

## TABLE I

### How Major Welding Processes Rate on Common Metals and Alloys

Welding Process	Carbon Steels	Austenitic Stainless Steels	Cast Iron	Aluminum Base Alloys	Copper* Base Alloys	Nickel* Base Alloys
Shielded metal-arc (coated electrode)	E	E	S	S	S	E
Submerged arc	E	E	U	U	U	U
Tig (tungsten-arc inert-gas)	S	E	S	E	E	E
Mig (metal-arc inert-gas)	S	E	U	E	E	E
Resistance	E	E	U	E	S	S
Brazing	E	E	E	E	E	S
Gas (oxy-acetylene)	E	S	E	S	S	

E—Excellent S—Satisfactory U—Unsuited \* See Tab

## TABLE II

### Process Ratings For Copper And Its Alloys

Welding Process	Copper*	Cu-Zn Alloys	Cu-Si Alloys	Cu-Sn Alloys	Cu-Al Alloys	Cu-Ni Alloys	Cu-Be Alloys
Shielded metal-arc (coated electrode)	U	S	S	S	S	S	S
Submerged arc	U	U	E	S	E	S	X
Tig (tungsten-arc inert-gas)	E	E	E	S	E	E	S
Mig (metal-arc inert-gas)	E	E	E	E	E	E	X
Resistance	U	S	E	E	U	U	X
Brazing	E	E	S	E	S	S	S
Gas	S	S	S	S	U	S	X

\* Deoxidized and oxygen-free coppers only

E—Excellent S—Satisfactory  
U—Unsuited X—No data available

## TABLE III

### Process Ratings For Nickel And Its Alloys

Welding Process	Nickel	K Monel	Inconel	Inconel X	Hastelloy B	Hastelloy C	Hastelloy W	Ni-75
Shielded metal-arc (coated electrode)	E	E	S	E	S	X	X	X
Submerged arc	U	U	U	U	S	S	S	U
Tig (tungsten-arc inert-gas)	E	E	S	E	S	E	X	E
Mig (metal-arc inert-gas)	E	E	S	E	S	E	X	
Resistance	S	S	S	S	S	X	X	X
Brazing	S	S	S	S	S	X	X	X
Gas	S	S	S	S	U	U	U	X

E—Excellent S—Satisfactory U—Unsuited X—No data available



(Photo from Armour Research Institute)

**THIS MIG equipment gives speed of automatic welding, plus flexibility.**

The copper-aluminum alloys, or aluminum bronzes, once again work very nicely with both welding processes. Gas welding is not used for the aluminum bronzes. Resistance welding these alloys sometimes causes difficulties, although with special techniques and care it can be used. Brazing also needs some particular care because the refractory aluminum oxide must be removed with proper fluxes to achieve good brazements.

The copper-nickel alloys are easily welded by most welding processes. Once again, these alloys are hot-short; and quick welding processes, such as Tig and Mig, offer definite advantages.

#### **Heat treat Cu-Be alloys after welding**

Copper-beryllium alloys are welded with the Tig process and may be welded with shielded metal-arc process or brazed. Since copper-beryllium alloys are often used in a heat treated condition, the heat of the joining processes could conceivably alter this performance. Therefore, it is essential that heat treating be done after joining to bring about the desired spring properties.

Processes for welding nickel and nickel-alloys need detailed treatment. This information is presented in Table III. Once again, the predominance of the Tig and Mig welding processes shows up while metal-arc and resistance welding processes work well for the more commonly encountered nickel materials.

Since some nickel materials are hot-short, due consideration must be given stress conditions and welding speed. Also, there are stress corrosion possibilities with certain brazing filler metals, and these should be thoroughly

understood when brazing is selected as a joining process.

While it is generally true that all metals joined by welding must be clean and free from oxides, oil, grease and other contaminants, this is particularly true of nickel and nickel alloys.

Nickel, like most other nonferrous alloys, enjoys excellent technical service from the producers. For this reason, it will pay you to consult with the producers when welding nonferrous materials for the first time. Also, vendors of welding materials frequently have practical experience that can prove very helpful.

#### **Trend is to gas-shielded processes**

In recent years, there have been many changes in welding processes. In general, the Tig and Mig processes have come to the fore very strongly and have shown up well in welding austenitic stainless steels and the nonferrous metals. Shielded metal-arc welding with coated electrodes is strongest in the welding of carbon steels and austenitic stainless steels. It is less widely used in nonferrous welding, having been displaced to a considerable extent by Tig and Mig welding.

Submerged arc welding has shown growing application and is predominantly used for carbon steels and austenitic stainless steels. It, also, has some specialized applications in the nonferrous welding areas where it performs very well.

Resistance welding shows up very strongly in joining carbon steels, austenitic stainless steels and aluminum, while it is less readily used for the other nonferrous materials. Since the range of applications where resistance welding is strongest accounts for well over 90 pct of all welding in that area, it is apparent that no severe limitations are placed on the usability of the process.

Brazing has really become an outstanding method of joining. It lends itself well to automation and, in addition, works quite well on many very troublesome materials which would otherwise be exceedingly difficult to join. Gas welding, meanwhile, has declined, mostly from lack of speed and on a cost basis.

#### **Want Extra Copies?**

A limited number of copies of "How To Get More For Your Metalworking Dollar" are available. You can get one to three free copies, including the welding charts, by sending your request to Readers' Service Dept., The Iron Age, Chestnut and 56th Streets, Philadelphia 39, Pa. Additional copies may be obtained at cost.

# Welding Rod and Electrode Charts

## Producers of Rods

For Carbon and Stainless Steels, Aluminum,  
Copper, Nickel and Magnesium Alloys

(Numbers indicate producing companies. See key on reverse side.)

	Gas	Carbon Arc	Atomic Hydrogen	Inert-Gas Tungsten-Arc	Inert-Gas Metal-Arc	Submerged Arc	Braze Welding
<b>ASTM Spec.</b>							
<b>Fabrication Steels</b>							
A7	1, 4, 18, 20, 21, 22	1, 4, 18, 21, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 20, 22	1, 4, 13, 18, 23, 24
A53	1, 4, 18, 20, 21, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 20, 22	1, 4, 13, 18, 23, 24
A129	1, 4, 18, 20, 21, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 20, 22	1, 4, 13, 18, 23, 24
A131	1, 4, 18, 20, 21, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 20, 22	1, 4, 13, 18, 23, 24
A201	1, 4, 18, 20, 21, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 20, 22	1, 4, 13, 18, 23, 24
A202	1, 4, 18, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 22	1, 4, 13, 18, 23
A203	1, 4, 18, 21, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	18, 22	1, 4, 13, 18, 23, 24
A204	1, 4, 18, 21, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 22	1, 4, 13, 18, 23
A212	1, 4, 18, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 20, 22	1, 4, 13, 18, 23, 24
B225	1, 4, 7, 18, 22	1, 4, 7, 18, 22	1, 7, 18, 22	1, 7, 18, 22	1, 7, 18, 22	7, 17, 18, 22	1, 4, 7, 13, 18, 23
A283	1, 4, 18, 21, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 22	1, 4, 13, 18, 23, 24
A285	1, 4, 18, 21, 22	1, 4, 18, 22	1, 18, 22	1, 18, 22	1, 18, 22	17, 18, 22	1, 13, 18, 23, 24
<b>AISI Types</b>							
<b>Stainless Steels—Austenitic</b>							
301	1, 2, 3, 4, 12, 18, 22	4, 12, 18, 22	1, 12, 18, 22	1, 8, 12, 18, 22	1, 8, 12, 18, 22	8, 12, 18, 22	1, 4, 13
302	1, 2, 4, 12, 18, 22	4, 12, 18, 22	1, 12, 18, 22	1, 8, 12, 18, 22	1, 3, 8, 12, 18, 22	3, 8, 12, 18, 22	1, 4, 13
302B	1, 2, 12, 18	12, 18	1, 12, 18	1, 12, 18	1, 12, 18	12, 18	1, 13
303	1, 2, 18	18	1, 18	1, 18	1, 18	18	1, 13
304	1, 2, 3, 4, 12, 18, 22	4, 12, 18, 22	1, 12, 18, 22	1, 8, 10, 12, 18, 22	1, 3, 8, 12, 18, 22	3, 8, 12, 17, 18, 22	1, 4, 13
308	1, 2, 3, 4, 12, 18, 22	4, 12, 18, 22	1, 12, 18, 22	1, 8, 10, 12, 18, 22	1, 3, 8, 10, 12, 14, 18, 22	3, 8, 10, 12, 17, 18, 22	1, 4, 13
309	1, 2, 3, 4, 12, 18, 22	4, 12, 18, 22	1, 12, 18, 22	1, 8, 10, 12, 18, 22	1, 3, 8, 10, 12, 14, 18, 22	3, 8, 10, 12, 18, 22	1, 4, 13
309S	1, 2, 12, 18	12, 18	1, 12, 18	1, 8, 12, 18	1, 8, 12, 18	8, 12, 18	1, 13
310	1, 2, 3, 4, 12, 18, 22	4, 12, 18, 22	1, 12, 18, 22	1, 8, 10, 12, 18, 22	1, 3, 8, 10, 12, 14, 18, 22	3, 8, 10, 12, 18, 22	1, 4, 13
316	1, 2, 3, 4, 12, 18, 22	4, 12, 18, 22	1, 12, 18, 22	1, 8, 10, 12, 18, 22	1, 3, 8, 10, 12, 14, 18, 22	3, 8, 10, 12, 18, 22	1, 4, 13
317	2, 3, 12, 18	12, 18	12, 18	12, 18	3, 12, 18	3, 12, 18	
321	1, 2, 3, 4, 12, 18	4, 12, 18	1, 12, 18	1, 8, 10, 12, 18, 19	1, 3, 8, 10, 12, 14, 18, 19	3, 8, 12, 18, 19	1, 4, 13
347	1, 2, 3, 4, 12, 13, 18, 22	4, 12, 13, 18, 22	1, 12, 13, 18, 22	1, 8, 10, 12, 13, 18, 19, 22	1, 3, 8, 10, 12, 14, 18, 19, 22	3, 8, 10, 12, 18, 19, 22	1, 4, 13
<b>AISI Types</b>							
<b>Stainless Steels—Martensitic</b>							
403	2, 18	18	18	8, 18	1, 8, 18	8, 18	
410	2, 3, 4, 12, 18, 22	4, 12, 18, 22	12, 18, 22	8, 12, 18, 19, 22	1, 3, 8, 12, 18, 19, 22	3, 8, 12, 18, 19, 22	4
420	2, 3, 4, 12, 18, 22	4, 12, 18, 22	12, 18, 22	8, 12, 18, 19, 22	1, 3, 8, 12, 18, 19, 22	3, 8, 10, 12, 18, 22	4
501	2, 12, 18, 22	12, 18, 22	12, 18, 22	12, 18, 22	12, 18, 22	12, 18, 22	
502	2, 8, 12, 18, 22	12, 18, 22	12, 18, 22	8, 12, 18, 19, 22	1, 8, 12, 18, 19, 22	8, 12, 18, 19, 22	

(Chart continued on next page)

## Producers of Rods (Continued)

	Gas	Carbon Arc	Atomic Hydrogen	Inert-Gas Tungsten-Arc	Inert-Gas Metal-Arc	Submerged Arc	Braze Welding
AISI Types Stainless Steels—Ferritic							
405	2, 10	10	10	10	10	10	
430	2, 3, 4, 12, 10, 22	4, 12, 10, 22	12, 10, 22	8, 12, 10, 10, 22	1, 3, 8, 12, 10, 10, 22	3, 8, 12, 10, 10, 22	4
442	2, 10	10	10	8, 10	8, 10	8, 10	
446	2, 3, 12, 10	12, 10	12, 10	8, 12, 10, 10	1, 3, 8, 12, 10, 10	3, 8, 12, 10, 10	
Commercial Designation Aluminum Alloys							
2B	1, 4, 8, 13, 10, 20, 21	1, 8, 13, 10	1, 4, 5, 13, 10, 20, 21	1, 4, 5, 13, 10, 20, 21	1, 4, 5, 14, 10, 20		4, 13
3S	1, 4, 10, 21	1, 10	1, 4, 10	1, 4, 10, 21	1, 4, 10		4, 13
4S	1, 4, 10, 21	1, 4, 10	1, 4, 10	1, 4, 10, 21	1, 4, 10		4, 13
43S	1, 4, 8, 13, 10, 20, 21	1, 4, 8, 13, 10	1, 4, 5, 13, 10, 20, 21	1, 4, 5, 13, 10, 20, 21	1, 4, 5, 14, 10, 20		4, 13
52S	1, 4, 10, 21	1, 4, 10	1, 4, 10	1, 4, 5, 10, 21	1, 4, 5, 10		4, 13
53S	1, 4, 10, 21	1, 4, 10	1, 4, 10	1, 4, 10, 21	1, 4, 10		4, 13
61S	1, 4, 10, 21	1, 4, 10	1, 4, 10	1, 4, 10, 21	1, 4, 10		4, 13
63S	1, 4, 10, 21	1, 4, 10	1, 4, 10	1, 4, 10, 21	1, 4, 10		4, 13
70S	21			21			
ASTM Designation Magnesium Alloys							
M1A	4, 5, 11	4, 5	5	4, 5, 11	11		4, 11, 13
AZ31B	4, 5	4, 5	5	4, 5, 11	11		4, 13
AZ61A	4, 5, 13	4, 5, 13	5, 13	4, 5, 11, 13	1, 11		4, 13
AZ63A	4, 5	4, 5	5	4, 5, 11	1, 11		4, 13
AZ90A	4, 5	4, 5	5	4, 5, 11	1		4, 13
AZ92A	4, 5, 13	4, 5, 13	5, 13	4, 5, 11, 13	1, 11		4, 13
Types Copper Alloys							
Deoxidized copper	1, 4, 8, 13, 10, 23	1, 13, 10, 23	1, 13, 10	1, 8, 13, 10, 23	1, 8, 7, 10	7, 10, 23	1, 4, 8, 9, 23, 24
Low brasses	1, 4, 7, 13, 10, 23	7, 13, 10, 23	7, 13, 10	1, 7, 13, 10, 23	1, 7	7	1, 4, 6, 7, 24
High brasses	1, 4, 8, 7, 9, 13, 10, 23	7, 13, 10, 23	7, 13, 10	1, 7, 13, 10, 23	1, 7	7	1, 4, 6, 7, 24
Silicon bronzes	4, 8, 9, 13, 10, 23	8, 9, 13, 10, 23	13, 10	8, 7, 9, 13, 10, 23	1, 8, 7, 9, 10	7, 10, 23	1, 6, 24
Phosphor bronzes	4, 7, 13	8, 7, 13, 20	13	8, 7, 13	1, 8, 7	7	1, 4, 6, 7, 24
Aluminum bronzes	4, 7, 13	7	7	1, 8, 7	1, 8, 7, 10	7, 10	4, 7, 24
Copper-nickel	4, 8, 10	10	10	7, 8, 10	1, 7, 8, 10	7, 8	4, 6, 24
Beryllium copper							4, 6
Types Nickel Alloys							
Nickel	10		10	8, 10	1, 4, 8, 10	8, 10	4, 13, 24
LC Nickel	10		10	10	10	10	
"D" Nickel	10		10	10	10	10	
Duranickel	10		10	10	10	10	
Monel	10		10	8, 10	1, 4, 8, 10	8, 10	4, 13, 24
"K" Monel	10		10	10	10	10	
"K" Monel	10		10	10	10	10	
Ni-Cr Alloys	10		10	8, 10	8, 10	8	4, 13
Inconel	10		10	10	1, 4, 8, 10	8	4, 13
Inconel "X"	10		10	10	10	10	
Hastelloy B, C, F, X, W	10		10	10	10	10	
Hastelloy D	10		10	10	10	10	

Availability of rods from manufacturers listed in these tables does not necessarily imply that these rods will meet every welding condition and service requirement. Because results can differ from job to job, consult with the manufacturer before selecting rod.

## Rod and Electrode Manufacturers

(Numbers are key to rod producers)

- 1 Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.
- 2 Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa.
- 3 Alloy Metal Wire Div., H. K. Porter Co., Inc., Prospect Park, Pa.
- 4 Alloy Rods Co., York, Pa.
- 5 All-State Welding Alloys Co., 249-55 Ferris Ave., White Plains, N. Y.
- 6 Aluminum Co. of America, Pittsburgh 19, Pa.
- 7 Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 46, Wis.
- 8 Arcos Corp., 1500 S. 50th St., Philadelphia 43, Pa.
- 9 Bridgeport Brass Co., Bridgeport 2, Conn.
- 10 Canadian Liquid Air Co., Ltd., 1111 Beaver Hall Hill, Montreal, Can.
- 11 Champion Rivet Co., Harvard Ave. & E. 100th St., Cleveland, Ohio
- 12 Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 22, Pa.
- 13 Dow Chemical Co., Midland, Mich.
- 14 Drawall Corp., Lincoln Hwy. W & Alloy St., York, Pa.
- 15 Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing, N. Y.
- 16 General Electric Co., 1 River Road, Schenectady 5, N. Y.
- 17 Harnischfeger Corp., 4400 W. National Ave., Milwaukee 46, Wis.
- 18 Haynes Steelite Co., Kokomo, Ind.
- 19 Hobart Bros. Co., Hobart Square, Troy, Ohio

- 16 International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
- 17 Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio.
- 18 Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.
- 19 Marquette Mfg. Co., Inc., 307 E. Hennepin Ave., Minneapolis 14, Minn.
- 20 Maurath, Inc., P. O. Box 817, Cleveland 22, Ohio.
- 21 McKay Co., York, Pa.
- 22 Metal & Thermit Corp., 100 E. 42nd St., New York 17, N. Y.
- 23 National Cylinder Gas Co., 840 N. Michigan Ave., Chicago 11, Ill.
- 24 Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.
- 25 C. E. Phillips & Co., 2750 Poplar St., Detroit 8, Mich.
- 26 Reid-Avery Corp., Dundalk, Baltimore 22, Md.
- 27 Revere Copper & Brass, Inc., Rome, N. Y.
- 28 Scovill Mfg. Co., 100 Mill St., Waterbury Conn.
- 29 Seymour Mfg. Co., Seymour, Conn.
- 30 A. O. Smith Corp., Milwaukee 1, Wis.
- 31 Steel Co. of Canada, Ltd., P. O. Box 440, Montreal, Can.
- 32 Westinghouse Electric Corp., Pittsburgh 30, Pa.

# The IRON AGE

## welding rod and electrode

ASTM-AWS Specification No.	Current	Air Reduction Sales Co.	Alloy Rods Co.
E-308-15	dc	Airco 19-9 Lime	Arcalloy 308 Lime
E-308-16	ac or dc	Airco 19-9 Titanium	Arcalloy 308 ac-dc
E-309-15	dc	Airco 25-12 Lime	Arcalloy 309 Lime
E-309-16	ac or dc	Airco 25-12 Titanium	Arcalloy 309 ac-dc
E-310-15	dc	Airco 25-20 Lime	Arcalloy 310 Lime
E-310-16	ac or dc	Airco 25-20 Titanium	Arcalloy 310 ac-dc
E-316-15	dc	Airco 18-12 Mo Lime	Arcalloy 316 Lime
E-316-16	ac or dc	Airco 18-12 Mo Titanium	Arcalloy 316 ac-dc
E-317-15	dc	Airco 18-12 3.5 Mo Lime	Arcalloy 317 Lime
E-317-16	ac or dc	Airco 18-12 3.5 Mo Titanium	Arcalloy 317 ac-dc
E-330-15	dc	Airco 35N 15 Cr Lime	Arcalloy 330 Lime
E-330-16	ac or dc	Airco 35N 15 Cr Titanium	Arcalloy 330 ac-dc
E-347-15	dc	Airco 19-9 Cb Lime	Arcalloy 347 Lime
E-347-16	ac or dc	Airco 19-9 Cb Titanium	Arcalloy 347 ac-dc
E-410-15	dc	Airco 12 Lime	Arcalloy 410 Lime
E-410-16	ac or dc		Arcalloy 410 ac-dc
E-430-15	dc	Airco 16 Cr Lime	Arcalloy 430 Lime
E-430-16	ac or dc		Arcalloy 430 ac-dc
E-502-15	dc	Airco 4-6 Cr Mo Lime	Arcalloy 502 Lime
E-502-16	ac or dc		Arcalloy 502 ac-dc

ASTM-AWS Specification No.	Electrode Coating	Welding Position	Air Reduction Sales Co.	Alloy Rods Co.
E-7010	High Cellulose Sodium	F, V, OH, H	Airco 93	
E-7011	High Cellulose Potassium	F, V, OH, H	Airco 382	
E-7015	Low Hydrogen Sodium	F, V, OH, H		
E-7016	Low Hydrogen Potassium	F, V, OH, H	Airco 327	Atom-Arc 7016M
E-7020	High Iron Oxide	H-Fillets, F	Airco 94	
E-8015	Low Hydrogen Sodium	F, V, OH, H		
E-8016	Low Hydrogen Potassium	F, V, OH, H	Airco 385, 390	Atom-Arc 8016M, 8016CM
E-9015	Low Hydrogen Sodium	F, V, OH, H		
E-9016	Low Hydrogen Potassium	F, V, OH, H	Airco 354	Atom-Arc 9016CM
E-10013	High Titanium	F, V, OH, H		
E-10015	Low Hydrogen Sodium	F, V, OH, H		
E-10016	Low Hydrogen Potassium	F, V, OH, H	Airco 394, 351	Atom-Arc 10016MM
E-12015	Low Hydrogen Sodium	F, V, OH, H	Airco 352	Atom-Arc 12016NMY

Coating formulas for electrodes are generally not covered by specifications, and

## Aluminum Arcwelding Electrodes

AISI-AWS Specification No.	Air Reduction Sales Co.	All-State Welding Alloys Co.	Arcoa Corp.	Canadian Liquid Air Co.	Champion Rivet Co.	Eutectic Welding Alloys Corp.	Hobart Bros. Co.	Lincoln Electric Co.	Marquette Mfg. Co.	Metal & Thermit Corp.	National Cylinder Gas Co.
Al-2		All-State No. 30	Alumend 25			Eutec Trode 2102				AL-2	
Al-43	Airco 57	All-State No. 32	Alumend 43S	LA Aluminum	Type E-43	Eutec Trode 2100	Hobart Aluminum	Aluminweld	No. 70	AL-43	Sureweld 1217-C

electrode charts (continued)

## Corrosion Resisting Steel Arcwelding Electrodes

Specs	All-State Welding Alloys Co.	Arcoa Corp.	Canadian Liquid Air Co.	Champion Rivet Co.	Eutectic Welding Alloys Corp.	General Electric Co.	Harnischfeger Corp.	Hobart Bros. Co.	Lincoln Electric Co.	The McKay Co.	Marquette Mfg. Co.	Metal & Thermit Corp.	Maurath Inc.	National Cylinder Gas Co.	Reid-Avery Corp.	A. O. Smith Corp.	Westinghouse Electric Corp.
308		Chromend K	Arcalloy 308 Lime	308-1		W-1308	Harstain 18-8	No. 308	Stainweld A5	McKay 18-8 dc Lime		Murex 18-8	Maurath 18-8-S dc, Lime	Sureweld 308	Racalloy 18-8 dc Lime	SW-262	308-15
308	All-State 18-8	Stainlend K	Arcalloy 308 Titanium	308-2	Eutec-Stain Trode B	W-2308	Harstain A 18-8	No. 308	Stainweld A7	McKay 18-8 ac-dc	No. 308	Murex Type 308	Maurath 18-8-S, ac-dc	Sureweld 308	Racalloy 18-8 ac-dc	SW-162	308-16
309		Chromend HC	Arcalloy 309 Lime	309-1		W-1309	Harstain 25-12	No. 309	Stainweld B-Cb	McKay 25-12 dc Lime		Murex 25-12	Maurath 309, ac-dc	Sureweld 309	Racalloy 25-12 dc Lime	SW-166	309-15
309	All-State 299	Stainlend HC	Arcalloy 309 Titanium	309-2	Eutec-Stain Trode C	W-2309	Harstain A 25-12	No. 309		McKay 25-12 ac-dc	No. 309	Murex Type 309	Maurath 309-CB	Sureweld 309	Racalloy 25-12 ac-dc		309-16
310		Chromend HCN	Arcalloy 310 Lime	310-1		W-1310	Harstain 25-20	No. 310	Stainweld D	McKay 25-20 dc Lime		Murex 25-20	Maurath 310, ac-dc	Sureweld 310	Racalloy 25-20 dc Lime	SW-159	310-15
310	All-State 252	Stainlend HCN	Arcalloy 310 Titanium	310-2	Eutec-Stain Trode D	W-2310	Harstain A 25-20	No. 310		McKay 25-20 ac-dc	No. 310	Murex Type 310	Maurath 310, ac-dc	Sureweld 310	Racalloy 25-20 ac-dc	SW-350	310-16
316		Chromend K Mo	Arcalloy 316 Lime	316-1		W-1316	Harstain 18-8-2 Mo	No. 316		McKay 18-8 Mo (316) dc Lime		Murex 18-8 Mo	Maurath 316	Sureweld 316	Racalloy 18-12 Mo 316 dc Lime	SW-160	316-15
316		Stainlend K Mo	Arcalloy 316 Titanium	316-2	Eutec-Stain Trode A-Mo	W-2316	Harstain A 18-8-2 Mo	No. 316		McKay 18-8 Mo (316) ac-dc	No. 316	Murex Type 316	Maurath 316	Sureweld 316	Racalloy 18-12 Mo 316 ac-dc	SW-265	316-16
317		Chromend 18-8 Mo	Arcalloy 317 Lime	317-1		W-1317	Harstain 18-8-3 Mo	No. 317		McKay 18-8 Mo (317) dc Lime		Murex Type 317	Maurath 317	Sureweld 317	Racalloy 18-12 Mo 317 Lime	SW-161	317-15
317		Stainlend 18-8 Mo	Arcalloy 317 Titanium	317-2	Eutec-Stain Trode B-Mo	W-2317	Harstain A 18-8-3 Mo	No. 317ac		McKay 18-8 Mo (317) ac-dc	No. 317	Murex Type 317	Maurath 317	Sureweld 317	Racalloy 18-12 Mo 317 ac-dc		317-16
330		Chromend 15-35	Arcalloy 330 Lime	330-1	NI-Tectic 222	W-1330		No. 330		McKay 15-35 dc Lime		Murex 15-35	Maurath 330	Sureweld 330	Racalloy 330 dc Lime		330-15
330			Arcalloy 330 Titanium	330-2		W-2330		No. 330ac		McKay 15-35 ac-dc	No. 330	Murex Type 330	Maurath 330	Sureweld 330	Racalloy 330 ac-dc		
347		Chromend 19-9 Cb	Arcalloy 347 Lime	347-1		W-1347	Harstain 18-8 Cb	No. 347	Stainweld A5Cb	McKay 18-8 Cb dc Lime		Murex 19-9 Cb	Maurath 347	Sureweld 347	Racalloy 18-8 Cb 347 dc Lime	SW-157	347-15
347		Stainlend 19-9 Cb	Arcalloy 347 Titanium	347-2	Eutec-Stain Trode A	W-2347	Harstain A 18-8 Cb	No. 347	Stainweld A7-Cb	McKay 18-8 Cb ac-dc	No. 347	Murex Type 347	Maurath 347	Sureweld 347	Racalloy 18-8 Cb 347 ac-dc	SW-357	347-16
410		Chromend 12	Arcalloy 410 Lime	410-1		W-1410		No. 410		McKay 12 Cr dc Lime		Murex 12 Cr	Maurath 410	Sureweld 410		SW-153	410-15
410			Arcalloy 410 Titanium	410-2				No. 410ac		McKay 12 Cr ac-dc	No. 410	Murex Type 410	Maurath 410	Sureweld 410			410-16
430		Chromend 16	Arcalloy 430 Lime	430-1		W-1430		No. 430		McKay 16 Cr dc Lime		Murex 16 Cr	Maurath 430	Sureweld 430			430-15
430			Arcalloy 430 Titanium	430-2				No. 430ac		McKay 16 Cr ac-dc	No. 430	Murex Type 430	Maurath 16-25-6	Sureweld 430			430-16
502			Arcalloy 502 Lime	Croloy 5A		W-1502	Harnchrome 5 Cr	No. 502		McKay 5 Cr Mo dc Lime		Murex Croloy 5A	Maurath 502	Sureweld 502			502-15
502		Chromend 5M	Arcalloy 502 Titanium	502-2	Eutec Trode 6H			No. 502ac		McKay 5 Cr Mo ac-dc	No. 502	Murex Type 502		Sureweld 502		SW-151	502-16

## Low Alloy Steel Arcwelding Electrodes

AISI-AWS Specification No.	All-State Welding Alloys Co.	Arcoa Corp.	Canadian Liquid Air Co.	Champion Rivet Co.	Eutectic Welding Alloys Corp.	General Electric Co.	Harnischfeger Corp.	Hobart Bros. Co.	Lincoln Electric Co.	McKay Co.	Marquette Mfg. Co.	Metal & Thermit Corp.	National Cylinder Gas Co.	Reid-Avery Corp.	A. O. Smith Corp.	Steel Co. of Canada	Westinghouse Electric Corp.
			LA Type 7010	Blue Devil 85		W-710A	CM-50	No. 885	Shield Arc 85, 85-P			Murex Murex Type MA	Sureweld MLY-50	Race 74	SW-75, SW-80	Stelco Electrode 710P	XL-710
				Croloy 1A		W-711A	CM-50-1					Murex Type MA	Sureweld MLY-C	Race 7011		Stelco Electrode No. 711	*ACF-711
16, No. 618		Tensilend 70	Atom-Arc 7016	Hy-Le	EutecTrode 66	W-716B	70-LA-2	16 or 718	Shield Arc LH-70 Jetweld 2-HT	Pluralloy 70AC	No. 7016	HTS-18	Sureweld 7016	Race 7016		Stelco Electrode 716S	LoH2-716
			LA Type 7020	Black Devil 75		W-720A	CM-50-2					Murex Type DM	Sureweld MLY-A	Race 64	SW-76	Stelco Electrode No. 720	DN-720
6CM		Chromend 1M Tensilend 60 Nickend 2, 3 Chromend 2M(S) Manganend 1M Chromend 2MA	Atom-Arc 8016M Atom-Arc 8016CM			W-916A W-916B	75-LP, 80-LE					Murex Type 8016-Q		Race 8016, 8016B1			
			Atom-Arc 9016CM	Croloy 2A Croloy 2 1/4A		W-916A	P & H #7					Croloy 2A Croloy 2 1/4A		Race 9015B2			
		Manganend 2M		Hy-Le 230-D	EutecTrode 71	W-1013A	AW-4		Planeweld 1		No. 110	Murex Type 2116	Sureweld 9016	Race 9016B2 Race Ma Mel Race 10013	SW-88		
		Tensilend 100	Atom-Arc 10016NM			W-1018A W-1016B	90-LH-2, P & H #12-2	1016		Pluralloy 100AC		Murex, Type AWL, 4216		Race 10016 Race Ma Mel Race 10016B3 Race 250 Race 126T			
		Tensilend 120	Atom-Arc 12016NMV			W-1215A	P & H 17-1, P & H 21			Pluralloy 120							

and performance may therefore vary from one electrode to another. The manufacturer's recommendations should be checked before making a selection.

## Copper Arcwelding

ASTM AWS Symbol	Air Reduction Sales Co.	Alloy Rods Co.	All-State Welding Alloys Co.	Ampco Metal, Inc.	Arcos Corp.	Canadian Liquid Air Co.	Champion Rivet Co.	Eutectic Welding Alloys Corp.	General Electric
E-Cu								Eutec Trade 30AC Eutec Trade 300DC	
E-Cu Sn A	Airco 70								W-2
E-Cu Sn C		Bronze Arc	All-State No. 24	Phos-Trade		Bronze Arc	Bronze Devil	Eutec Trade 28AC Eutec Trade 280DC Eutec Trade 2000	
E-Cu Ni					Nicuend				
E-Cu Si								Eutec Trade 29AC Eutec Trade 290DC Eutec Trade 1850AC Eutec Trade 1851DC	
E-Cu Al A2	Airco 100			Ampco-Trade 10					
E-Cu Al B	Airco 116			Ampco-Trade 160					
E-Cu Al C	Airco 120			Ampco-Trade 200					
E-Cu Al D	Airco 125			Ampco-Trade 250					
E-Cu Al E	Airco 130			Ampco-Trade 300					

## Iron Powder

ASTM-AWS Specification No.	Air Reduction Sales Co.	Alloy Rods Co.	A. O. Smith Corp.	Champion Rivet Co.	General Electric Co.	Harnischfeger Corp.	Hobart Bros. Co.	Eutectic
E 6014 Tentative	Easy-arc LH-716		SW-46	Speedeman 14		DH-6	Rocket 14	
E 6024	Easy-arc 12		SW-44	Speedeman 12	Strikeasy 1	DH-5	Rocket 24	
E 6027			SW-45				Rocket 27	
Low Hydrogen E 7016		Atom-Arc 7016	SW-47			DH-170, 179 LA	Rocket 716	

## Mild Steel Arcwelding

ASTM-AWS Specification No.	Electrode Coating	Welding Position	Air Reduction Sales Co.	Alloy Rods Co.	All-State Welding Alloys Co.	Arcos Corp.	Canadian Liquid Air Co.	Champion Rivet Co.	Eutectic Welding Alloys Corp.	General Electric Co.	Harnischfeger Corp.
E-4510	Sulcoated or Light Coated	F, V, OH, H	Airco 41, 63				SC 15	Processed Sulcoat		F, L	Washco
E-4520	Sulcoated or Light Coated	H-Fillets, F						Speed #44			
E-6010	High Cellulose Sodium	F, V, OH, H	Airco 78E		Monoweld No. 1		LA Type 6010	Blue Devil	Steel Tectic	W-610A W-610S W-611A	AP, AP
E-6011	High Cellulose Potassium	F, V, OH, H	Airco 290		Monoweld No. 1		LA Type 6011	Bluedac	Steel Tectic		AC-1
E-6012	High Titania Sodium	F, V, OH, H	Airco 323, 327		Monoweld No. 1		LA Type 6012	Gray Devil Gray Devil #2	Steel Tectic	W-612A W-612B	PF, PF
E-6013	High Titania Potassium	F, V, OH, H	Airco 80, 90-A		No. 613, Steelarc		LA Type 6013	Gray dac Tan Devil	Uni Matic 6000	W-613A	AC-3, S
E-6015	Low Hydrogen Sodium	F, V, OH, H									70 LA-1
E-6016	Low Hydrogen Potassium	F, V, OH, H	Airco 312	Atom-Arc 7016		Tensilend 70	HFA LA 7016	Hy-L	Eutec Trade 68 Eutec-Hand-Omatic #1	W-616A (W-620A W-620B W-620C	70 LA-1
E-6020	High Iron Oxide	H-Fillets, F	Airco 306, 315				LA 6020	Black Devil			DH-2, 3
E-6030	High Iron Oxide	F						Red Devil	Eutec-Hand-Omatic #2		

## Welding Electrodes

General Electric Co.	Hobart Bros. Co.	International Nickel Co., Inc.	Lincoln Electric Co.	Marquette Mfg. Co.	Metal & Thermit Corp.	National Cylinder Gas Co.	C. E. Phillips & Co.	Reid-Avery Co.
W-70						20B	Crucible Arc No. 85	
	Arctroz		Aerisweld		Murex Type PB-57		Crucible Arc No. 80	Racalloy Phosphor Bronze
		Inco "137"		No. 61				
					Murex Type AB-12			
					Murex Type AB-16			
					Murex Type AB-20			
					Murex Type AB-25			
					Murex Type AB-30			

## Welding Electrodes

Lincoln Electric Co.	Marquette Mfg. Co.	McKay Co.	Metal & Thermit Corp.	National Cylinder Gas Co.	Reid-Avery Corp.	Steel Co. of Canada	Westinghouse Electric Corp.
Improved Fleetweld 47							
Jetweld 1	No. 12	Comet Arc	Murex Speedex	Sureweld 24	Raco 624		Zip 24
Jetweld 2			Murex Speedex LH		Raco 627		Zip 27
		716 IP			Raco 7016	716 IP	

## Welding Electrodes

Harnischfeger Corp.	Hobart Bros. Co.	Lincoln Electric Co.	McKay Co.	Marquette Mfg. Co.	Metal & Thermit Corp.	National Cylinder Gas Co.	Reid-Avery Co.	A. O. Smith Corp.	Steel Co. of Canada	Westinghouse Electric Corp.
Washcate	Sulkote	Stable-Arc	McKay 21	No. 101		Sureweld 30S	Blue Label		Stelco Electrode No. 4 bare, No. 4 FGW	Sulcoat-18
			McKay 3			Sureweld 30XL	D, M-9 Knurled			
AP, APV	No. 10	Fleetweld 5, 5-P	McKay 15, 15-D	No. 105	Murex Type R	Sureweld B	Raco 7	SW-10	Stelco Electrode No. 704, 704D	XL-610
AC-1	No. 335	Fleetweld 35, 180	McKay 11	No. 130	Murex Type A	Sureweld CB	Raco 11	SW-14	Stelco Electrode No. 504, 504D	ACP-611
PF, PFA	No. 12, No. 77, No. 212	Fleetweld 7, 72	McKay 17, 116	No. 120	Murex Genex, Genex M	Sureweld N, NM, G	Raco 8	SW-11, 12, 17, 29	Stelco Electrode No. 604	FP-612 FP2-612
AC-3, SM	No. 13, No. 313, No. 447	Fleetweld 37, Planeweld 2	McKay 24	No. 151, No. 140, No. 6013	Murex, Alternex, Type U	Sureweld C, CE, CN	Raco 13A, 13B	SW-15, SW-16	Stelco Electrode No. 404	SW-613 SW2-613 SW3-613
70 LA-1							Raco 100-15			
70 LA-1	No. 16 or 716	Shield-Arc LH70	Piuralloy 70AC		Murex Type HTS		Raco 180-16	SW-64, SW-65		LOH2-616
DH-2, DH-3	No. 111		McKay 16	No. 115	Murex Type FHP	Sureweld FD	Raco 20	SW-35	Stelco Electrode No. 804	DH-623
			McKay 18		Murex Type D		Raco 5		Stelco Electrode No. 904	



(Photo from Armour Research Institute)

**THIS MIG equipment gives speed of automatic welding, plus flexibility.**

The copper-aluminum alloys, or aluminum bronzes, once again work very nicely with both welding processes. Gas welding is not used for the aluminum bronzes. Resistance welding these alloys sometimes causes difficulties, although with special techniques and care it can be used. Brazing also needs some particular care because the refractory aluminum oxide must be removed with proper fluxes to achieve good brazements.

The copper-nickel alloys are easily welded by most welding processes. Once again, these alloys are hot-short; and quick welding processes, such as Tig and Mig, offer definite advantages.

#### **Heat treat Cu-Be alloys after welding**

Copper-beryllium alloys are welded with the Tig process and may be welded with shielded metal-arc process or brazed. Since copper-beryllium alloys are often used in a heat treated condition, the heat of the joining processes could conceivably alter this performance. Therefore, it is essential that heat treating be done after joining to bring about the desired spring properties.

Processes for welding nickel and nickel-alloys need detailed treatment. This information is presented in Table III. Once again, the predominance of the Tig and Mig welding processes shows up while metal-arc and resistance welding processes work well for the more commonly encountered nickel materials.

Since some nickel materials are hot-short, due consideration must be given stress conditions and welding speed. Also, there are stress corrosion possibilities with certain brazing filler metals, and these should be thoroughly

understood when brazing is selected as a joining process.

While it is generally true that all metals joined by welding must be clean and free from oxides, oil, grease and other contaminants, this is particularly true of nickel and nickel alloys.

Nickel, like most other nonferrous alloys, enjoys excellent technical service from the producers. For this reason, it will pay you to consult with the producers when welding nonferrous materials for the first time. Also, vendors of welding materials frequently have practical experience that can prove very helpful.

#### **Trend is to gas-shielded processes**

In recent years, there have been many changes in welding processes. In general, the Tig and Mig processes have come to the fore very strongly and have shown up well in welding austenitic stainless steels and the nonferrous metals. Shielded metal-arc welding with coated electrodes is strongest in the welding of carbon steels and austenitic stainless steels. It is less widely used in nonferrous welding, having been displaced to a considerable extent by Tig and Mig welding.

Submerged arc welding has shown growing application and is predominantly used for carbon steels and austenitic stainless steels. It, also, has some specialized applications in the nonferrous welding areas where it performs very well.

Resistance welding shows up very strongly in joining carbon steels, austenitic stainless steels and aluminum, while it is less readily used for the other nonferrous materials. Since the range of applications where resistance welding is strongest accounts for well over 90 pct of all welding in that area, it is apparent that no severe limitations are placed on the usability of the process.

Brazing has really become an outstanding method of joining. It lends itself well to automation and, in addition, works quite well on many very troublesome materials which would otherwise be exceedingly difficult to join. Gas welding, meanwhile, has declined, mostly from lack of speed and on a cost basis.

#### **Want Extra Copies?**

A limited number of copies of "How To Get More For Your Metalworking Dollar" are available. You can get one to three free copies, including the welding charts, by sending your request to Readers' Service Dept., The Iron Age, Chestnut and 56th Streets, Philadelphia 39, Pa. Additional copies may be obtained at cost.

**FEATURE  
ARTICLES**

**For critical components—**

By R. T. HOOK,  
Chief Metallurgist,  
The Warner & Swasey Co.,  
Cleveland

# **Alloy Steels Extend Machine Tool Service Life**

♦ Traditionally, most machine tools are built for a long service life . . . Today they need rugged component parts to stand up to the demand for ever faster cutting speeds and more horsepower.

♦ Warner & Swasey uses nickel alloy steels for highly stressed turret lathe components . . . The firm saves money by confining its inventory to three grades that will cover all requirements . . . Chief use is for parts that need core toughness under a hard case.

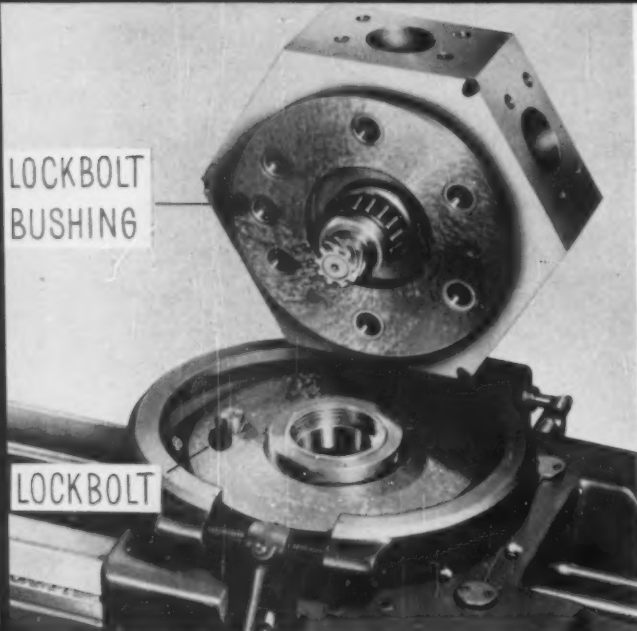
♦ IN ESSENTIAL design, many modern machine tools still resemble the types built a century ago. Moreover, they still perform the same basic functions. But today's machines are vastly more productive, due to their wide ranges of quickly obtained speeds and feeds, plus the fact that they have adequate horsepower for efficient metal removal in virtually all materials.

In company with this machine tool evolution, increasing demands were continually

made on the materials used in equipment components. Ordinary carbon steels gave reliable performance in earlier machine tool models. But the use of harder cutting tools with increased speeds and horsepower require something better.

The history of many machine tool parts shows that they have progressed in a series of steps, first through the lean alloys, then to medium rich compositions, and presently to the best alloy steels available. All of this improvement in materials has been for the purpose of giving machine tools the longest possible service life with maximum operating efficiency and economy.

Turret lathes produced by the Warner & Swasey Co., Cleveland, offer a typical example of manufacturing efficiency in the use of materials best suited to the requirements of specific machine parts. Overloading a machine with materials that exceed the margins of safety, reliability or service is unsound policy on two counts: (1) the buyer must pay more for his machine, and (2) the manufacturer fails to conserve metals in short supply.



LOCKBOLT and bushings locate turret index accurately, use A4615 steel to resist chipping as a result of constant mating of precision parts.

However, superior materials must be used for certain machine tool parts subject to excessive loads, repetitive shock conditions and extreme wear. For many of these components, Warner & Swasey specifies nickel alloy steels.

The firm's scale of specifications lists three AISI standard grades of alloy steel containing nickel: A4615, E3310 and E4340. These three types meet the widest range of turret lathe engineering requirements. The fact that the inventory can be limited in this manner means added savings.

The AISI A4615 carburizing grade is used for all case-hardened parts where there is a need for fatigue resistance, high core properties and minimum distortion in heat treatment. The material has good machinability, and a tough core and a file-hard case can be obtained by oil quenching the heat treated, machined parts.

#### Resists wear conditions

Typical turret lathe applications for the A4615 alloy are found in apron gears, sliding keys, lockbolts, splined shafts, wear plates, cams and safety couplings. For example, a lockbolt and mating lockbolt bushings are used to locate the hexagon turret index accurately. These parts mate repeatedly as the turret changes position. They must not chip or bend under severe service conditions. For this reason they must be made of a high endurance limit material, so as to retain the precision index accuracy built into the turret unit.

On the company's large turret lathes a turret-locating ring replaces the lockbolt bushing, but it is also made from the A4615 alloy. Service requirements for this part are likewise

#### Where and why alloy steels are used

##### A4615 . . .

High core strength, fatigue resistance, minimum distortion from heat treating make it valuable for gears, sliding keys, lockbolts, splined shafts, wear plates.

##### E3310 . . .

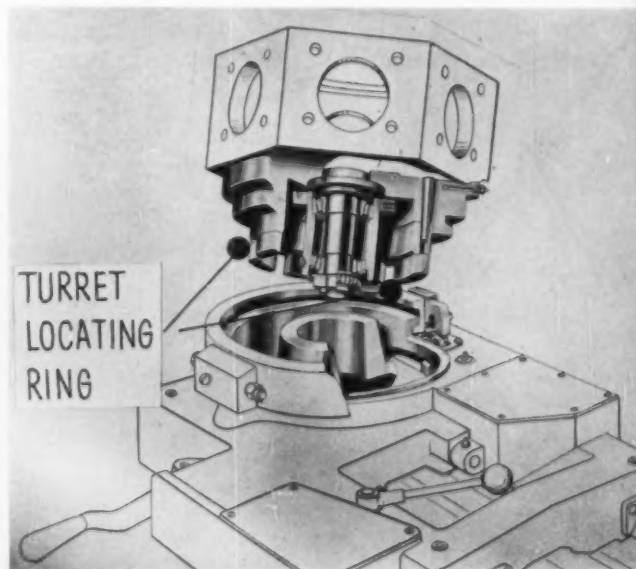
Used in power chuck wrenches, positive tooth clutches, shafts. Has higher core strength, toughness, case hardness, resistance to wear and shock.

##### E4340 . . .

Features combination of superior strength and high hardness for use in highly stressed pinions and gears, pinion shafts, collets and wrenches.

severe, and any deformation in the ring would destroy the accuracy of the turret index. Minimum distortion during heat treatment makes A4615 an especially suitable grade for these critical turret components.

The same alloy does double duty in that an extra heat treatment will improve its properties for use in certain other turret lathe parts. This consists of heating to 1575°F and oil quenching, followed by a reheating to 1400-1450°F and oil quenching again.



TURRET locating ring is made from A4615 alloy which resists distortion during heat treatment, also has good fatigue-resistance qualities.

The extra treatment produces finer grain, a tough core, and a case with greater resistance to impact. Typical mechanical properties of the double-quenched core are listed on page 102.

For toughness and wear resistance in parts that are very highly stressed, such as clutches and shafts, the E3310 carburizing grade is used. It provides an ultimate strength superior to the A4615 alloy. One of the strongest and deepest hardening steels, the E3310 nickel-chromium composition provides exceptionally high core strength and toughness. Typical core properties, produced when parts are stress relieved at low temperatures, are also briefly described on page 102.

#### Withstands "hammer" blows

The most outstanding application of the E3310 alloy is in the shaft for a power wrench that operates geared scroll chucks. Lugs on the end of the shaft are subjected to a hammer-blow action as the wrench engages the chuck pinions. The lugs must hold their shape so that the chuck will operate properly. The shaft itself must provide long service life since it is expensive to manufacture and time-consuming and difficult to replace.

Top spot on the list of Warner & Swasey's specifications for direct hardening steel is held by the E4340 chromium-nickel-molybdenum alloy. This grade will oil-harden in heavy sections, and it is used for highly stressed pinions and gears that must have superior strength combined with good hardness and toughness. This alloy has tensile strength of about 290,000

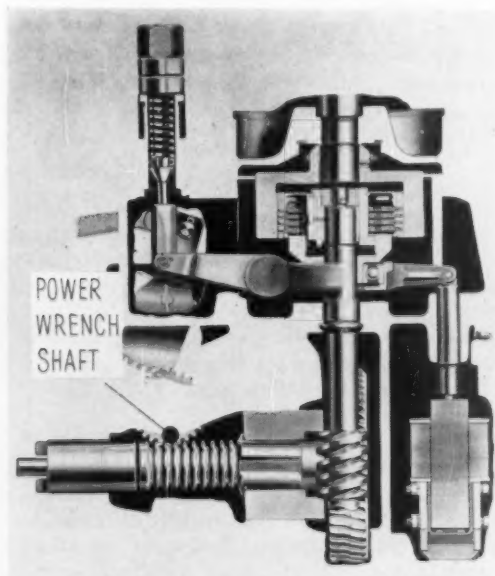
psi. In certain turret lathe parts, added resistance to surface fatigue is obtained by shot peening.

Rack pinion shafts that take the full thrust of the apron feed are made from the E4340 alloy. Higher horsepowers and heavier feeds used in modern machines make it desirable, from an "operational ease" standpoint, to use a high strength, high endurance steel for these shafts. The alternative would be a design change to "beef up" the shaft diameter, but this would make the entire unit heavier and clumsy to operate.

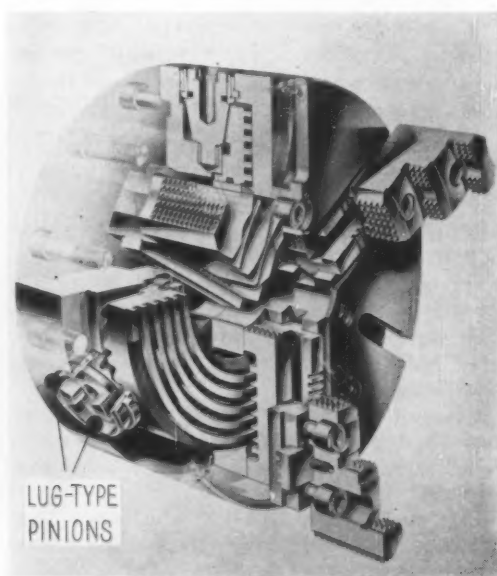
Another use of the E4340 alloy is in the front shaft pinion, a shift gear that is subject to high tooth loading during the shifting operation. If these gears do not retain their shape, roughness and vibration may result and be reflected in a loss of accuracy and desirable surface finish on the part being machined.

Steel fingers also made from E4340 steel operate the collet for gripping the workpiece. Because bar stock worked on turret lathes may vary in size, deflection of these fingers is used to compensate for size deviations. In effect, the fingers are large leaf springs subject to repetitive high stresses. And they must recover their original shape after such stressing.

Future increases in machine tool speeds, plus the possible advent of new cutting materials, will tend to put more machine components in the "critical" group. Warner & Swasey engineers expect that these developments will necessitate additional applications for nickel alloy steels, all of which will add to machine tool precision and service life.



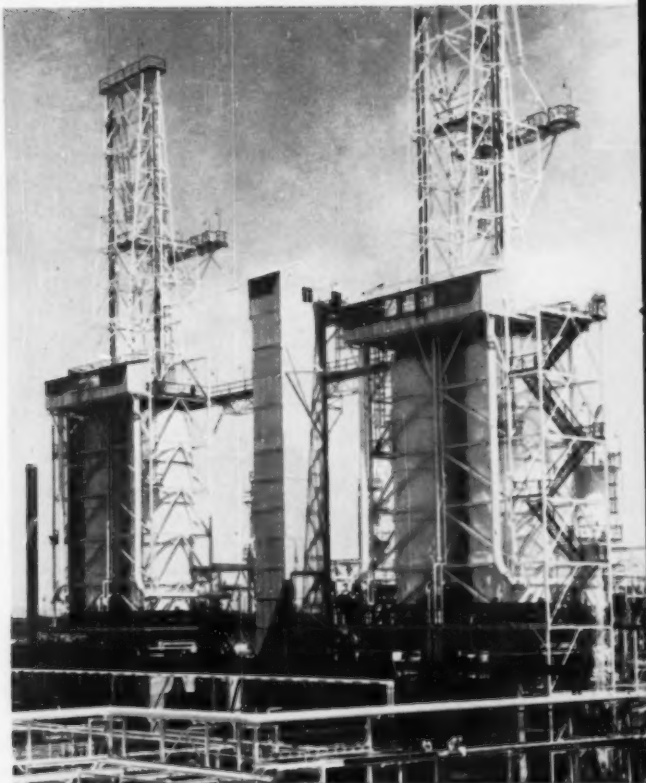
POWER wrench shaft is subject to shock and wear, is made from E3310 (Ni-Cr) steel alloy heat treated for a tough core, high hardness.



LUG-type pinions on geared scroll chuck are made from E4340 grade to withstand severe stress. Alloy develops tensile strength of 290,000 psi.

Vessel serves as furnace—

# Giant Stress Relieving Jacket Keeps Heat On Job



**STRESS-RELIEVED** in place, these four 75-ft-tall coke drums at West Coast refinery were jacketed with mineral wool blankets, each in turn; brought to 1200°F minimum with large oil-fired burners.

♦ Proper stress relief plays a big part in getting long service life out of some types of large field-fabricated structures . . . With vessels, it can be done by making the vessel serve as its own stress-relieving furnace.

♦ **STRESS-RELIEVING** anything as sizeable as 75-ft-tall coke drums for refineries, 18-ft in diam, is strickly an "in place" operation. It's a hefty job, and one calling for close temperature control—both to reduce stresses effectively and to prevent excessive heat losses to the surrounding air.

But how do you go about tackling such a job? And particularly, how do you prevent heat losses in view of the large surface areas involved?

Chicago Bridge & Iron Co., which runs into such problems in field-fabricating units like the huge vessels used in chemical and petroleum processing industries, meets the first problem by turning the structures themselves into temporary, giant furnaces. They fire large, port-

♦ Preventing excessive heat loss is another problem . . . Here's how Chicago Bridge & Iron Co. met this one recently, in stress-relieving four 75-ft coke drums . . . Material sufficient for one jacketing did entire job, with minimum losses.

able oil-fired burners—capable of delivering up to 40-million btu per hour—directly into the vessels. This brings them up to the desired critical temperature.

That's how the coke drums were handled. Chicago Bridge put up four of the units for a large west coast oil refinery.

## Wrap drums in insulation

The second problem—that of preventing excessive heat losses to the atmosphere—was met with the use of high temperature thermal insulation. This material helps them reach and maintain the critical temperature within the required time limits.

They simply wrapped the spun mineral blankets around the vessels, each in turn. The

### Insulation Exhibits These Properties:

**Is made of felted mineral fibers, uniform in thickness, density.**

**Prevents excessive radiation, convection losses to 1400°F.**

**Won't fracture or dust excessively.**

**Has thermal conductivity less than 0.27 at 75°F mean temperature, or 0.33 at 200°F.**

insulation permits holding temperature at 1200°F minimum, with maximum variation of less than 150°F as required by the ASME code.

Normally a lower-cost mineral felt would be used than was used, and would have been thrown away after the job was done. This time there was more than the one vessel to be stress-relieved, though—and using the same insulating material for all four drums would mean less waste. So a better grade mineral wool blanket was chosen. One capable of standing up under

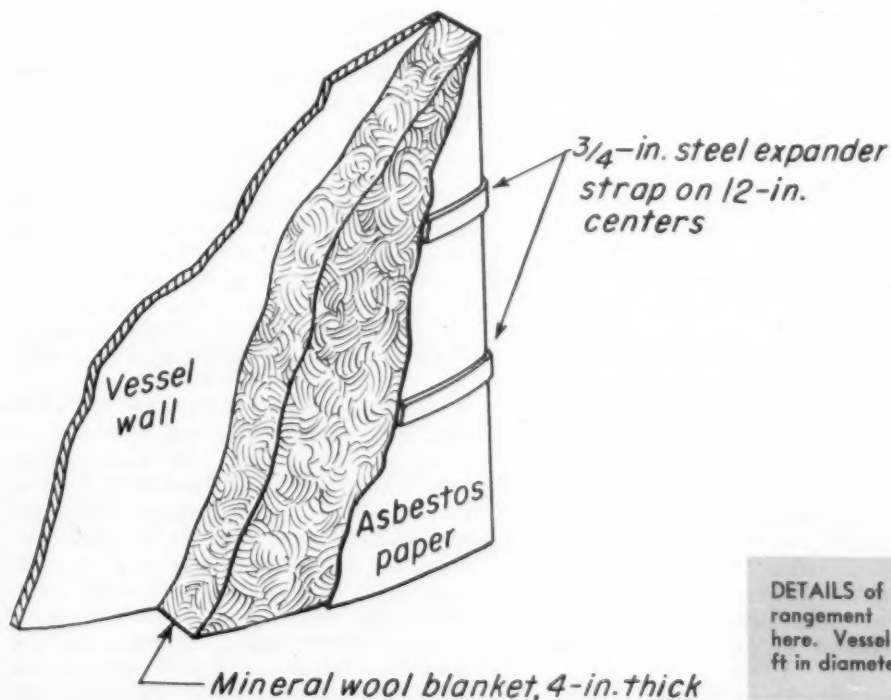
higher temperatures and the abuse of the added handling.

They stress-relieved each vessel in turn. Blankets—made by Baldwin-Hill Co. of Trenton, N. J., and Huntington, Ind.—were reinforced on one side by expanded metal lath, on the other by 1-in. wire mesh. Wrapped around the vessels, they not only satisfactorily limited heat loss at the high temperatures involved (to 1400°F maximum), but also withstood the eight handling operations involved with remarkably little mechanical damage.

For the entire job, fewer than 5000 sq ft of the 4-in. blankets were used. Each vessel has a surface area of about 4200 sq ft.

Drums are built of ASTM A-204 plate. This is lined with 7/64-in. ASTM A-240 18 pct Ni-8 pct Cr, aluminum modified stainless. Drums are mounted on concrete platforms 30-ft above grade. Three-quarter in. stainless steel bands are used to cinch the blankets to the drums. These bands are of expander type to allow for thermal expansion of the drums. Protection is afforded against rain and wind by asbestos paper, sheathing the blankets under the steel strapping. For fill-in around vessel outlets, spun mineral wool of 4-in. thickness and 4-lb density is used.

Weather during the stress-relieving operations was its usual changeable self. For example, the first vessel was treated while outside temperature was a balmy 70°F. Another of the quartet was treated while ambient hovered slightly below 40°F. It rained during one test and (the refinery being located on the sea-coast) more than average wind was prevalent.



DETAILS of jacketing arrangement are shown here. Vessel wall runs 18 ft in diameter.

# Chemists Troubleshoot Shop's Metalworking Puzzlers

By A. J. ZVARICK,  
Chemist,  
Superior Tube Co.,  
Norristown, Pa.

◆ **YOUR METALWORKING CHEMIST** most likely has buried talents. You can be sure those talents aren't put to best use if most of his working day centers around analyzing incoming raw material. That's part of his job, but he has another important job in areas where chemistry can strongly bolster more efficient and less costly metal processing.

Properly directed, the chemical analyst assumes a prominent role in controlling, testing and upgrading the basic processing chemicals of the metals industry.

Lubricants for drawing, extruding, forming and machining must be tested and selected, as well as tailored to match conditions varying from operation to operation. Pickling, plating and chemical coating solutions must be analyzed for renewal, checked for impurities, and juggled in chemical composition to improve finishes. Furnace atmospheres must be constantly monitored, particularly in heat treating metals sensitive to contamination.

Such examples are typical, but describe only a fraction of the broad duties carried out by chemical laboratories in some metalworking plants.

In small shops, this places a heavy burden

◆ Know where your metal processing savings lie? . . . The chemist is one specialist who can tell you where much of your unnecessary expense is going, and how you can avoid it.

◆ The chemical lab, working closely with the plant on production problems, more than pays for its freight . . . It can also improve product quality and plant efficiency . . . Every metal-working production department can benefit by its service.

on limited manpower. But experience generally shows that as the chemical laboratory assumes heavier responsibilities and workloads, more can be expected.

Larger metal processing firms tend to break job responsibilities down. At Superior Tube Co., Norristown, Pa., seven chemists function as one section of the metallurgical department. There the chemistry group reaches into every producing department of the firm. Principally, it still handles analysis of raw stock for tubing production, carried out in the Analysis Subsection. Another subsection—Plant Chemistry—deals with materials used in mill processing.

## Match lubricant to draw operation

Test and control of drawing lubricants, as well as investigation of new drawing compounds, is solely the responsibility of the plant chemists. Superior Tube drawing operations require regular use of about 25 lubricants.

Lubricant selected by the chemists depends on the tube size being drawn, material hardness, and the drawing operation itself—tube reducing, mandrel drawing, plug drawing and sinking. One alloy can require as many as seven different lubricants in drawing to fin-

## Metalworking Chemists Can—

**Analyze —** Incoming raw material  
Heat treat atmospheres  
Pickling, plating baths

**Control —** Lubricant selection  
Cleaner contamination

**Improve —** Metal processing methods  
Product quality  
Worker safety

**Develop —** Corrosion standards  
Better product finishes  
Purchasing specs  
for processing  
chemicals

ished size. Correct lubricant for each operation assures maximum reduction per draw with minimum surface defects, galling, and pickup. All this contributes to improved product quality, longer die life and other more subtle factors lowering production costs.

Annealing and heat treating the variety of tubing metals means a number of different furnace atmospheres. Those now in use include Endogas, DX gas (from preburned city gas), cracked ammonia, burned ammonia, nitrogen and hydrogen.

Careful control of both gas composition and dew point is of prime importance. Faulty atmospheres might well result in severe scaling, nitriding, carburization or decarburization. Entire lots of heat treated tubing could then be rejected.

Plant chemists analyze both flue gases and those in the atmosphere prior to introduction into the furnace. The laboratory also supervises gas generator settings, dew point checks and satisfactory drying tower operation.

All tubing drawn at the Norristown mill is pickled in the acid house to remove oxide films or annealing discoloration. Acid baths must be constantly analysed for ion concentration.



MERCURY CATHODE equipment helps analyze nickel used in radio and television cathode tubes.

Iron buildup also is checked regularly, to determine whether additions of acid are needed or the entire bath requires renewing.

Often special tests determine recommendations to customers. Information thus obtained is not available elsewhere. For example, AISI Type 304 stainless steel is better than nickel for handling beer. But Monel or nickel is best for wine.

Through comprehensive tests, proprietary processing chemicals are evaluated and specified for production use. New and improved chemicals are checked as they become available.

All this plus many other plant chemistry duties are supplemented by activities of the analytical subsection in constantly checking composition of the metals used in drawing tube. Raw stock is analyzed for presence of certain critical elements, usually including carbon. Carbon determination equipment maintains an accuracy within close tolerances, measuring content in the range 0.005 to 1.5 pct.

Alloy complexity has increased substantially over the years. Various metals in the standard tubing line must be analyzed for 20 elements, and done speedily to avoid production bottlenecks. A total of 63 analyses comprises only part of current work schedule. In addition, special customer and experimental analyses are carried out.

### Accurate to one ppm

Mercury cathode, spectroscopic and spectrophotometric equipment are employed regularly. Hydrogen train apparatus is required for determination of hydrogen in titanium and zirconium.

The policy of turning constantly to the chemical laboratory apparently pays high dividends. Time and again, the chemists come up with unusual and often important discoveries contributing measurably to product quality and plant efficiency. This in addition to solving specific processing problems.

In 1/6 time—

## Shop Modified Diesinker Tracer-Grinds Cams

♦ **FINISH GROUND CAMS** are turned out in 24 minutes by an ingenious adaptation of a diesinking machine by The Glenn L. Martin Co., Baltimore. Cams previously were hand finished, an operation requiring 2½ hours.

Savings of 84 pct in time and labor are accompanied by an extremely high degree of standardization in finished cams. The diesinking machine normally tracer-mills gun turret interrupter cams. In the modification, spoiler mechanism parts for the TM-61 Matarador missile are finished to close tolerances.

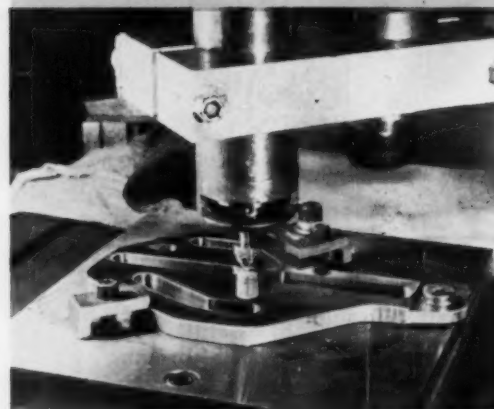
### Traces from hand-honed cam

An Excello high-speed, precision, 65,000 rpm air motor is mounted on a Deckel diesinking machine with a drilled and slotted block of cold rolled steel, 1¼ x 3 x 6 in. Air at 100 psi line pressure fed to the motor is regulated by a globe valve and pressure meter. The air motor is fitted with a precision chuck for a standard grinding point.

A hand finished cam serves as the pattern. The machine is set for a tracing ratio of one



**TRACER-GROUND** cam is produced on modified diesinking machine in 84 pct less time than hand finish.



**AIR MOTOR** operating at 35,000 rpm finish-grinds cam in 24 minutes. Adapter block is cold rolled steel.

to one. In its first job, the diesinker precision-ground the slots in wing spoiler cams. Actual grinding is done at about 35,000 rpm on high-carbon steel of 150,000 to 200,000 psi tensile.

Supplementary tooling for holding pattern or parts is unnecessary. The pattern is held to the table with Vulcan type clamps, using T-slots in the machine bed. A filler plate minimizes the distance between the cams and the air-motor. This provides necessary cutter rigidity, essential for precision work.

The diesinking machine is operated manually. The tracing finger follows the outline of the pattern and the abrasive point grinds the required finish. Abrasive and metal dust produced by grinding is removed by a vacuum hose attached near the set-up. A mirror assures the operator that all is well behind the grinding spindle.

Saving in hours is phenomenal. Use of this attachment has pointed the way to the elimination of manual operations on many other jobs. Short production runs lend themselves particularly well to this type of setup.

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**JOHN BUTLER TYTUS** dreamed that steel could be rolled in a continuous strip. In 1904, fresh from Yale University, he went to work as a laborer in the rolling mill to learn the craft, rose to mill superintendent and worked out the techniques and blueprints of his continuous rolling mill during World War I. It took him until December, 1923, to build the first mill and another six months of trial operation to produce satisfactory sheets. Today, billions of dollars worth of smooth-finished, deep drawing sheets roll at ever-increasing speeds from the continuous mills of America.

## *Great Names in Steel Making #I*

**T**o the public, beneficiary of the high quality and lower cost of continuous rolled steel in a thousand products, John Butler Tytus is virtually unknown. But within the steel industry, his is one of the great names.

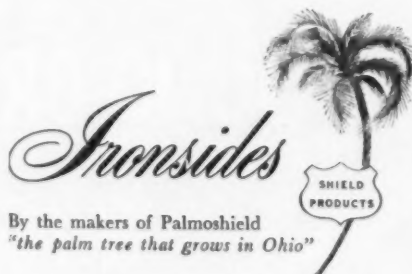
There are other names — names of men and of products — similarly unknown to the public but of important significance to steel men. The name "Palmoshield" is an example.

It is four years since Fortune magazine carried the first report of Palmoshield: "New All-American Lubricant Frees Rolling Mills from Hazards of Foreign Supply." The time was March, 1952, midway in the Korean War, and before that year was out, millions of pounds of Palmoshield had displaced imported palm oil for tin plate rolling in American and Canadian mills. Its use invariably proved so satisfactory that this volume has since doubled and tripled. Not only has Palmoshield made its place in tin plate rolling but in sheet rolling, long terne and coating lines as well. Today, on its fourth anniversary, "Palmoshield" has won an honored place in the dictionary of steel.

Names of other Ironsides "Shield" lubricants have been highly regarded

in the steel plants for many years. Ironsides "roll neck shield," formulated for continuous application by automatic pressure, is known as the lubricant that keeps roll necks at constant temperature. Ironsides "roller bearing shield," an extreme pressure lubricant noted for high load-carrying capacity, is approved by leading makers of bearings.

Just as special problems had to be overcome before mills could roll steel in a continuous strip, almost every plant has lubrication problems special to its operation. Ironsides engineers are "custom tailors" of lubrication who welcome such opportunities to be helpful. Direct your letter or telephone call to The Ironsides Company, Columbus 16, Ohio.

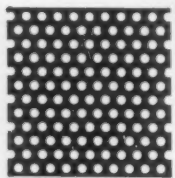




JOSEPH MARCUS

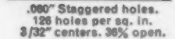
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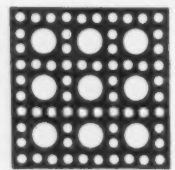
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892 holes per sq. in.  
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We have tools for perforating thousands of different patterns.



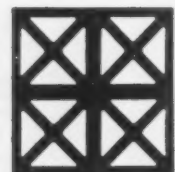
.000" Staggered Holes.  
128 holes per sq. in.  
3/32" centers. 30% open.

We will be glad to work with you on your perforating problems.



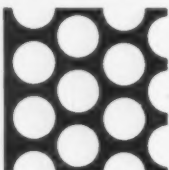
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Perforating all metals, Masonite, plywood, paper, cloth and plastic.



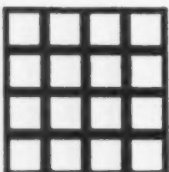
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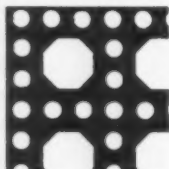
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## New Technical Literature:

### Catalogs and Bulletins

#### Air filter

Bulletin No. 234-C explains an automatic dry-type air filter's application, operation, construction and performance characteristics. The filtering media used in the unit is described as a porous, tissue-thin sheet of felted fibers in jackstraw arrangement which has proved entirely satisfactory for removing lint, ink mist and dust from the air.

*American Air Filter Co., Inc.*

For free copy circle No. 1 on postcard p. 117

#### Precision bearings

Information on anti-friction bearings for special applications is now available in Catalog AFB-1. Dimensions and load ratings are given for single row, double row, deep groove radial, and angular contact bearings. In addition, general bearing requirements for special designs, high and low temperatures, corrosion resistant and non-magnetic properties, and electrical conductivity and insulating features are discussed in this 32-page illustrated catalog.

*Industrial Technics, Inc.*

For free copy circle No. 2 on postcard p. 117

#### Control valves

A new 6-page bulletin on a company's line of pilot operated control valves is now ready. The bulletin describes in detail the operation, uses and optional features of the single and double solenoid valves. It is illustrated with over two dozen half-tone cuts and line drawings.

*Valvair Corp.*

For free copy circle No. 3 on postcard p. 117

#### Grinding wheels

"Electronic Formulation," describes a firm's process of applying the precision of electronics to the calculation of manufacturing formulas for customer's grinding wheels through use of computers.

*Bay State Abrasive Products Co.*

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### FOR YOUR COPY

**Money-saving products and services are described in the literature briefed here. For your copy just circle the number on the free postcard, page 117.**

#### Gas generators

Use of inert gas generators for protection against fire and explosion hazards is covered in Bulletin IGG-155. In addition to detailed drawings, photographs, capacity and dimension tables, the book contains a useful information sheet. Ample space is provided for an analysis of the work to be done by the gas generators, operating conditions, utilities needed and other data necessary for proper selection of type and size of unit.

*Roots-Connersville Blower Div., Dresser Industries, Inc.*

For free copy circle No. 5 on postcard p. 117

#### Product research

"Pedigreed Parts," is a booklet containing the story of the engineering and research behind one firm's parts. Revealed are examples of the research and testing operations that precede the production of a part—how the fuel spray pattern in fuel injection equipment is studied, gage-testing track shoes on concrete, testing steel for track rollers, and others.

*Caterpillar Tractor Co.*

For free copy circle No. 6 on postcard p. 117

#### Fasteners

A 44-page condensed catalog covers a company's line of bolts, nuts, rivets, screws and other industrial fasteners. It contains illustrations, sizes, packaging information and prices on the line.

*Clark Bros. Bolt Co.*

For free copy circle No. 7 on postcard p. 117

### Overhead conveyors

An illustrated bulletin describes many of a company's lines of overhead conveying equipment and hardware, including chain hoists, monorail carriers, continuous conveyors and various types of locks, switches, and transfers. The overhead conveying equipment is described as specially designed to speed up materials handling operations, eliminate wasted floor space, and increase safety and efficiency. *Colorado Fuel and Iron Corp.*

For free copy circle No. 8 on postcard p. 117

### Wound cores

Publication of a new 32-page bulletin on a line of wound cores has been announced. The booklet provides complete parts list of standard 4 mil and 12 mil "C" cores and toroidal cores. Included are mechanical dimensions, tolerances and weights. *Thomas & Skinner, Inc.*

For free copy circle No. 9 on postcard p. 117

### Electrical tapes

Four-page brochure, (P6-1), is available describing a company's newly packaged line of electrical tapes. It lists each tape by composition and function. Among the tapes covered are those of polyethylene, vinyl plastic, plastic coated cloth and others. *Polyken Sales Div., Kendall Co.*

For free copy circle No. 10 on postcard p. 117

### Industrial flooring

Publication of a new industrial floors bulletin (3-3), is announced. This 4-page bulletin explains in detail a company's two standard corrosion-resistant industrial floors. Complete estimating data is available with a thorough explanation of the differences in construction for both types of floors. *Atlas Mineral Products Co.*

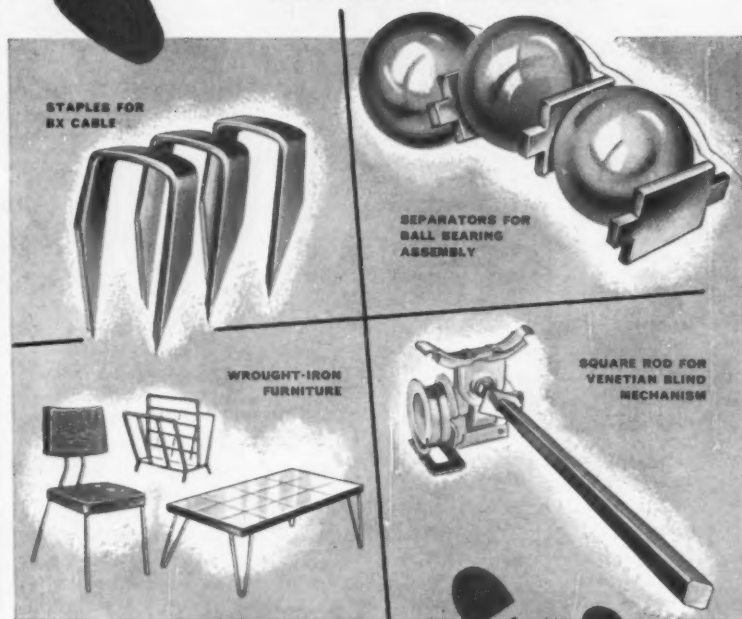
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### Carbon steel tube

Four-page bulletin tells how, in a number of case histories, one firm's electric-resistance-welded carbon steel mechanical tubing solved engineering problems and simplified production. *Tubular Products Div., Babcock & Wilcox Co.*

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Or, it might better be our **Short Run Method**, using economical blanking dies and stock punches.

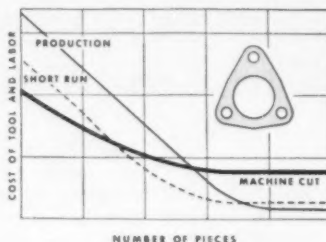
Sometimes, even with very short runs, it pays to use our **Production Method** with a standard die or our own surprisingly inexpensive Hecht-type tool.

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For example, take the part illustrated. From 1-65 parts, our Machine-Cut Method is most economical. At 65 parts, the Short-Run Method is best until, at 7,000 units, the standard Production Method is most satisfactory.

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## FREE TECHNICAL LITERATURE

### Cloth tape

A new brochure describes how silver cloth tape aids in duct installation. According to the brochure some of the features of the tape, designated Permacel 691, which aid installation are: application without using any cutting device, sticking regardless of weather conditions and unwinding smoothly and easily. *Permacel Tape Corp.*

For free copy circle No. 13 on postcard p. 117

### Toolholders

Design advantages, exclusive features, specifications and a price list for parts are included in a folder on a toolholder for throwaway inserts. Tips on how to get the most out of the tool are also given. *Adamas Carbide Corp.*

For free copy circle No. 14 on postcard p. 117

### PVC valve

Circular, describing a new valve and fittings, mentioned as the first all-molded corrosion-resistant PVC valve ever designed, has been published. Detailed information, including advantages, installation data and dimensions of PVC valves and fittings, is contained in the new circular. *Lunkenheimer Co.*

For free copy circle No. 15 on postcard p. 117

### Small press brake

A new 4-page bulletin (No. 131-56), illustrates and describes the design and construction features, with complete specifications, of one firm's 11 ton capacity press brake. *Dreis & Krump Mfg. Co.*

For free copy circle No. 16 on postcard p. 117

### Power hack saw

New bulletin covers a large capacity saw which will now take 4 in. x 4 in. square members or 4 in. OD rounds and pipe. It is also capable, the maker says, of angle cutting up to 4 in. x 4 in. *Sales Service Machine Tool Co.*

For free copy circle No. 17 on postcard p. 117

### Gear shavers

Rotary gear shaving machines for shaving external or internal spur and helical gears by the conventional shaving process are described in a new 12-page, 2-color catalog. Specification tables are included. *National Broach & Machine Co.*

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The expansion increases machining, welding and assembly facilities with more floor space and new machine tools. A new power plant moves the KVA load from 300 to 750 KVA capacity.

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# FREE TECHNICAL LITERATURE

These publications describe money-saving equipment and services . . . they are free with no obligation . . . just circle the number and mail the postcard.

This section starts on p. 112

## Continuous cast bronze

One firm's method for continuous casting of copper base alloys, their advantages, examples of the products they can form and their properties and characteristics are contained in Bulletin 300. *American Smelting and Refining Co.*

For free copy circle No. 19 on postcard

## Fasteners

Pins for use where quick release and positive self-locking are required are described in a 4-page bulletin. Construction features, application information, dimensional and strength data are included. Pins especially designed to specification are included. *Aviation Developments, Inc.*

For free copy circle No. 20 on postcard

## Plate clamp

A plate lifting clamp which lifts plates horizontally as well as vertically or to or from either position is detailed in Bulletin 600. Construction features and specifications are included. Also described and pictured are a double-duty set screw clamp, a jack-knife vertical plate clamp and a coil lift. *Lucker Mfg. Co.*

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## Heat treat equipment

Catalog 54 is a 24-page publication illustrating and describing a manufacturer's line of processing and heat treating equipment. Space is given to carburizing and annealing boxes, annealing covers and tubes, cyanide and lead pots, furnace tubes and parts, process piping, welded alloy and many other products. *Pressed Steel Co.*

For free copy circle No. 22 on postcard

## Hot spray painting

"Why Hot Spray?" is a booklet answering questions and explaining the advantages of hot spray painting for industrial and automotive use. In the hot spray process, the booklet states, heat reduces viscosity of the material; maintains constant temperature and constant viscosity; and deposits a high solids film, since most solvents evaporate between gun and target. This results, the literature says, in controlled spray painting, with application factors unchanged throughout the day and from day to day. *Spee-Flo Co.*

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## Precision strip

Precision strip in various metals—developed to meet requirements for optimum uniformity and accuracy—is described in a new bulletin. Its application in units for equipment in the fields of radio, television, radar, communications, computers and automation are discussed and illustrated. Physical and mechanical properties are listed. *Penn Precision Products, Inc.*

For free copy circle No. 24 on postcard

## Corrosive-proof pipe

Corrosion and contamination are discussed in a technical folder covering one firm's process for positive corrosion control. The illustrated 8-page booklet contains information on nickel-lined pipe which reportedly will withstand any fabrication without affecting the adherence of the nickel. Facilities for processing the pipe in random lengths from 1½ in. to 24 in. in diameter and 20-21 ft long are covered in detail. *Bart Mfg. Corp.*

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### Insulation

"Johns-Manville Insulations" is a new 20-page catalog on thermal insulations and refractories for general industrial applications. Designed to provide information on the composition, physical and thermal properties and sizes of the various products, it lists benefits which the products provide both at the time of installation and in service. It covers materials for the efficient control of temperatures from 400°F below zero to 3000°F above. *Johns-Manville.*

For free copy circle No. 26 on postcard

### Mercury vapor lights

"Better Industrial Lighting with Mercury Vapor," a new booklet, has been announced. It contains a summary of eight basic advantages of using mercury vapor lamps in industrial plants. It also includes a section on engineering hints for effective installations; discusses the proper use of high bay reflectors; tells various ways to meet color requirements, and contains information on how to combine mercury vapor lamps with fluorescent or incandescent lighting. *Sylvania Electric Products, Inc.*

For free copy circle No. 27 on postcard

### Electric heaters

Bulletin GEC-1005G is a 60-page publication on heaters and heating devices which contains application index, calculating data, specifications, operating information, and list prices of one firm's heaters and heating devices. Included are immersion, strip, cartridge, tubular, fin, and railroad switch heaters; unit heaters, soldering irons, glue pots, oven equipment, and control. *General Electric Co.*

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### Ribbon burners

Complete line of ribbon burners—heating units intended for use where a narrow, uniform sheet or "ribbon" of flame is desired—are covered in Bulletin SC-1004. Their heating techniques, selection data for their specification, and unit capacities are all detailed. *Selas Corp. of America.*

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### Controls

Second edition of one firm's general catalog gives a picture of the products and services offered by the firm for the field of automation. Some of the products covered are differential transducer control and automation systems, a complete line of time control equipment including electronic, equipment operator mechanisms, valves, counters and electronic contactors. *Automatic Temperature Control Co.*

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### Wrought iron fittings

A new folder describing wrought iron welding fittings and flanges has just been published. The folder gives dimensional data on one firm's products in sizes from 1/2 in. through 12 in., discusses the physical properties of the material, and illustrates typical applications. *Tube Turns, Div. of National Cylinder Gas Co.*

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### Metallic cleaners

A new 4-page bulletin on application of cleaners in preparing metallic surfaces for electroplating, anodizing, painting and other decorative or protective coatings is offered. The bulletin explains the different types of metallic cleaning processes: soak cleaning, electrocleaning, barrel cleaning, spray washing machine cleaning, and specific purposes cleaning. A reference chart is included showing the proper cleaner and process to be used with aluminum, brass, copper, steel, lead, magnesium, tin and zinc. *Hanson - Van Winkle - Munning Co.*

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### Broached screw

Patented Thru-Broached screw is described and illustrated in a bulletin just released. The screw, a new version of the socket set screw, is described as having a symmetrical socket broached through its entire length for assembling and wrenching from either end. The bulletin contains tables of dimensions and torque values for the screw, recommended as ideal for automatic assembly methods using power screwdrivers. *The Bristol Co.*

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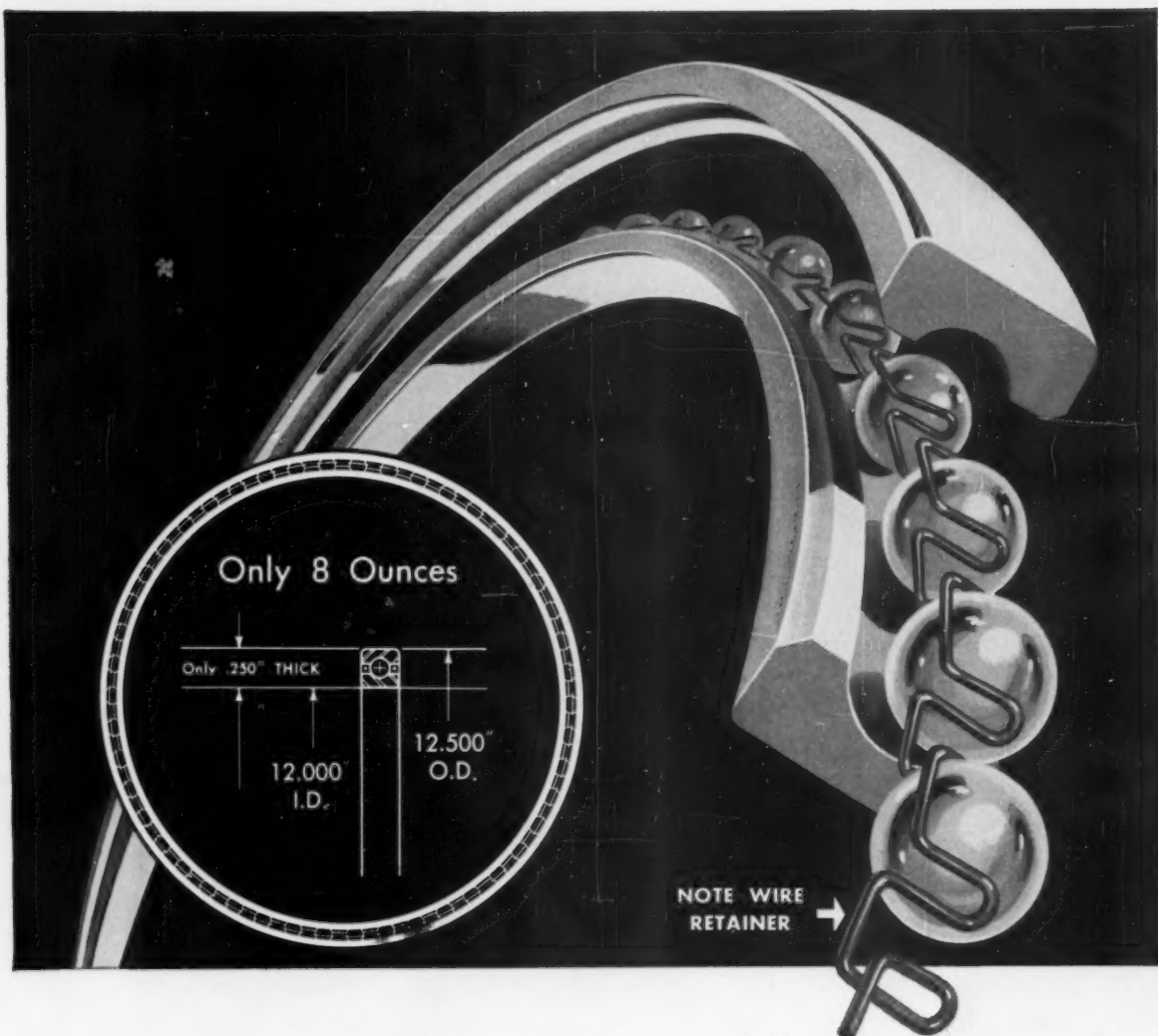
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## Save weight and space with world's thinnest radial ball bearings—*Real-Slim* by Kaydon

**H**ERE it is! A *Real-Slim* radial ball bearing with a wire separator that has just short of a full complement of balls for maximum capacity. What's more, you still get all the advantages of a separator between the balls. This design also gives you a bearing that's light-in-weight and is, without a question, the thinnest bearing ever built in this diameter.

Whatever your product design, there's a small or large diameter *Real-Slim* bearing that can be the right answer to your thin-section bearing problems.

The radial ball bearing, illustrated here, is *really slim* — 12.000" I.D., 12.500" O.D., .250" thick . . . and weighs only

eight ounces. It has 9,810 lbs. static load capacity, 1,256 lbs. at 100 rpm. Kaydon is able to produce *Real-Slim*, high-precision bearings because Kaydon specializes in the unusual.

Kaydon bearing engineers are prepared to give you valuable help with technical, thin-section bearing problems.

For detailed information on Kaydon's *Real-Slim* line, ask for engineering catalog No. 54-RS3 detailing:

***Real-Slim* Ball Bearings** — Conrad, angular contact and 4-point contact types in seven standard cross sections from  $\frac{1}{4}$ " to 1.000" and in bore diameters from 4" to 40".

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April 26, 1956

K-561

119



## "I like Airco 78E Electrodes because slag is so easy to remove"

Easy slag removal is just one of the many advantages of Airco 78E electrodes. This deep penetrating, all position electrode produces high quality weld metal which sets up rapidly. It is free from porosity, even when welding in the vertical down position. Especially recommended for welding mild steel where high ductility and tensile strength are essential.

This is but one of many electrodes in Airco's complete line that also includes stainless steel, hardfacing, cast iron, general and special purpose electrodes. Send for the free Airco Electrode Guide which will help you select the right electrode for your specific job. Request catalog 1318-IA.



## TECHNICAL BRIEFS

### INSPECTION: Plan X-Ray Unit

**Rapid, accurate inspection of steel thicknesses up to 10 in. sought through the use of a pair of supervoltage X-ray generators . . . Units of 1 and 2 million volt power will test reactor components.**

Plans for one of the most powerful and versatile X-ray installations in the metals industry have been disclosed.

The proposed facility will house two complementary Van de Graaff supervoltage X-ray generators, one and two million volts, respectively, both manufactured by High Voltage Eng. Corp., Cambridge Mass. The powerful machines will be used jointly in inspection of storage and pressure vessels and investigations of nuclear reactor chambers, states Chicago Bridge & Iron Co., the buyer.

The most striking aspect of this installation is the mounting planned for the 1-million-volt machine. This device will be fixed on the end of a 43-ft-long counter-weighted boom, mounted on rails, so designed as to easily fit inside vessels under test.

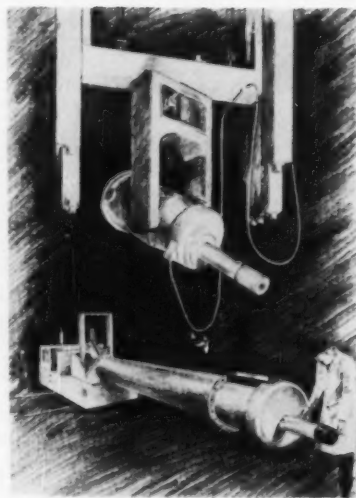
When used in conjunction with the 2-million-volt machine, which will be operated from an overhead crane mount, the number of circumferential radiographic inspections will be materially increased, allowing the company to check nearly four times as many units as before.

Both machines will be housed in a specially-built concrete structure, 42 ft wide and 115 ft long. Walls four feet thick will be topped by a roof 2½ ft in thickness. Doors at either end will simplify entry and exit.

According to High Voltage officials, this marks the most advanced application to date of supervoltage equipment for industrial radiography. It is expected that this new installation will also enable Chicago Bridge to fabricate welded vessels with greater wall thicknesses.

#### WANT MORE DATA?

*You may secure additional information on any item briefed in this section by using the reply card on page 117. Just indicate the page on which it appears. Be sure to note exactly the information wanted.*



**Artist's sketch of supervoltage x-ray installation.**

The 2-million-volt unit provides a means for rapid and accurate inspection of steel thicknesses up to 10 in., with less than one-minute exposure required for thicknesses under 5 in.

This machine records, with better-than-average sensitivity, discontinuities thinner than ½ pct of total thickness—far more sensitivity than that required by ASME welding codes. A thickness range of slightly more than 2 in. of steel can be recorded on a single film with a single exposure.

## Meetings:

**International Foundry Congress**  
will be held Sept. 1 to 9

The 23rd International Foundry Congress will be held this coming September 1 to 9 in Dusseldorf, Germany. The Congress will be combined with the GIFA, the first Foundry Trade Fair to be held at an international level.

The lecture program of the Congress, incorporating simultaneous translation of papers, will take place during two days. On the other three weekdays there will be numerous plant visits.

## Fastening:

**New device can be manually driven through 1/4 in. steel**

A new multi-use, manually-powered fastening tool has been described as "the greatest single forward step in fastening since the introduction of the powder-actuated tool just after World War II."

The tool, announced by the Olin Mathieson Chemical Corp., New York, is called Shure-Set. Sold by Ramset Fastening System, Cleveland, a part of Olin Mathieson, it is the first tool of its type to be manufactured in the United States. With the fastening device, states Mathieson, for the first time a worker can manually drive a fastener through one-quarter-inch steel.

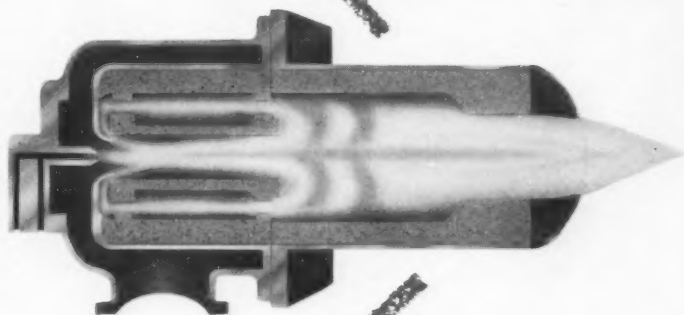
### Limits Tool Needs

"The new tool also means that the working man can do his job more efficiently while carrying fewer tools," Clarke Tryon, Ramset Sales manager, declared. "It has so many uses that in construction we sell it for around-the-building fastening work."

It is a well-known fact that a needle can be driven through a coin if it first goes through a cork. It is the support of the pin by the cork that makes this possible, Mr. Tryon pointed out. The tool works on the same principle. Proper support of the pin means maximum utilization of the energy ex-

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burners  
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Exclusive features: Quill feed and universal head movement give 360° range in two planes without extra attachment.

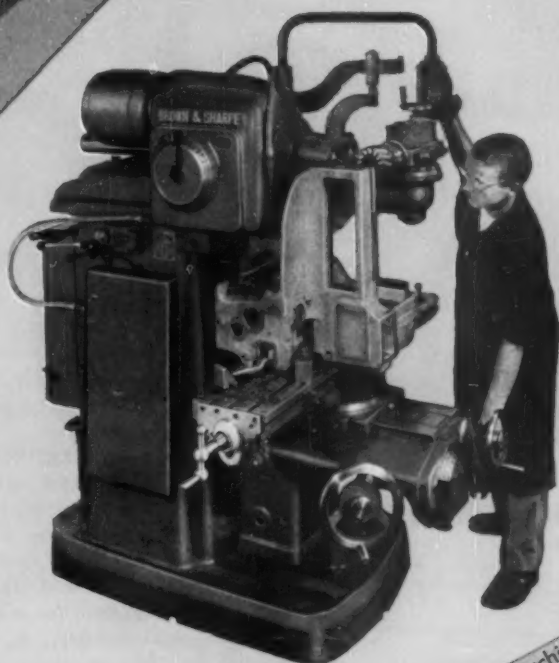
Both spindles on same vertical centerline. Massive ways, 22" wide, for sliding head. Sustained high-accuracy milling in any work position!

Available as universal or plain milling machine. Write for full details.

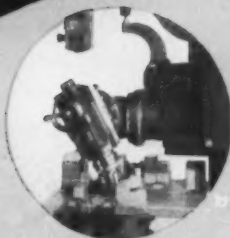
Brown & Sharpe Mfg. Co., Providence 1, R. I.

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28" table travel • 12" transverse feed  
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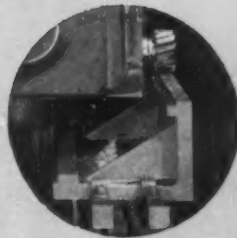
The Rangemaster (No. 20 Universal Milling Machine—sliding-head type).



Horizontal, vertical, or angular milling quickly available with full 3 h.p. at spindle.



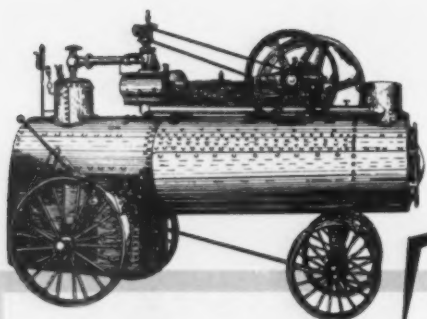
Universal head permanently mounted on crane—swings completely out of way when not in use. Both spindles always at ideal height for fast set-up and easy operation.



Full use of table travel plus exceptional sliding head range permits milling of many multi-surface jobs with only one work set-up.



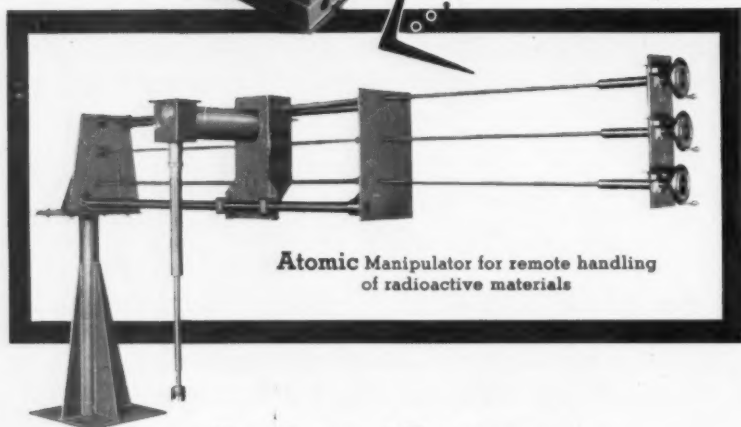
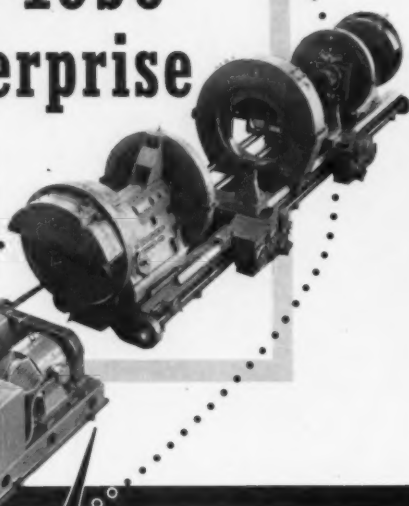
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## TECHNICAL BRIEFS

### "Fills need for multi-use fastening device . . ."

pended in swinging the hammer.

The new tool seats a specially-constructed fastener into a variety of materials such as concrete, concrete block, cinder block, brick and steel.

Shure-Set is described as filling a need for a multi-use fastening device for light fastening in work which cannot be done by such sim-



**Gripped tightly in the center,  
tool is hit with hammer.**

ple fastening techniques as the hammer and ordinary nail and which does not require the tremendous force provided in powder-actuated fastening tools, the company said. It is recommended by Ramset for more than 100 fastening jobs.

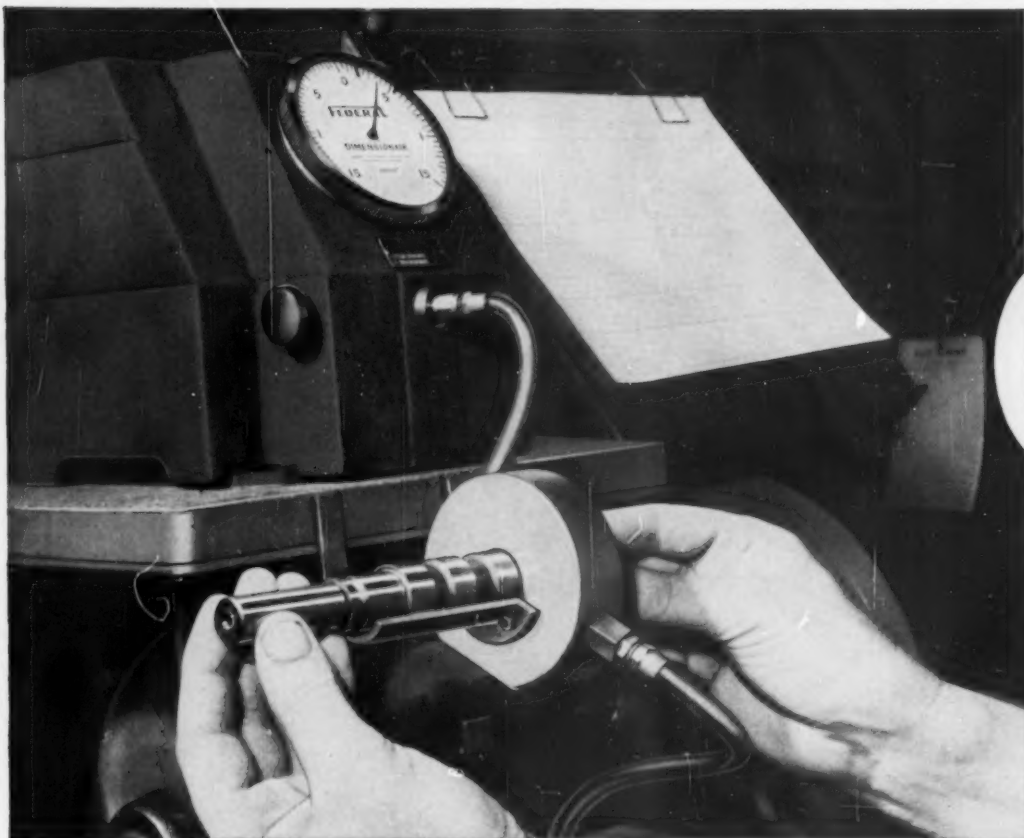
It ends the need for such fastening devices as toggle bolts, expansion shields, anchors, and concrete nails, and eliminates the tedious job of star drilling.

## Machining:

### Guide gives tips on best use of screw machine products

As a guide to those who must specify screw machine products, the annual report of National Screw Machine Products Assn. is designed to show the features of such products enabling customers to obtain the best possible part at the lowest possible cost.

"As with any production process," says the report, "complete knowledge of the screw machine process and what type of products may be produced is vital to



## Find out for yourself the facts about Dimensional Air Gages...it's easy!

**There's a lot of confusing talk today** about the merits of various air gages. With so many conflicting claims, it's difficult to learn the true facts. Each manufacturer of air gages naturally claims his is superior. So how are you going to determine which, in the long run, is the best for you to buy?

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so that all personnel involved can operate and compare it, feature by feature, with any other air gage on the market.

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## TECHNICAL BRIEFS

better understanding between suppliers and customers."

The most important point reported by the Association is that "a screw machine part obtains its final form through the process of machining material from the bar stock used, and accordingly, there are practically no limitations as to size, shape, design or quality.

"Small runs can be made on hand screw machines and larger ones on automatic screw machines. Close tolerances can be held, and an excellent finish can be obtained on any desired surface. And, screw machine products should be of special interest to materials and design engineers because they can be produced from a wide variety of materials with uniformity of product and product properties."

### Costs Dependent

On the subject of cost, the report points out that the cost of screw machine products is dependent on many factors. One of the biggest advantages, however, is the relatively low tooling cost as compared to the expense of special patterns, molds or dies. In producing screw machine parts, the usual tooling involves only perishable form tools and the setting up time required.

One of the most important basic elements of cost is the material used. To keep costs down, it is always best for the user to specify the most easily machined material consistent with the actual use of the finished part. "Free machining" steel or non-ferrous metal will always result in the lowest price, but it is sometimes necessary to specify a less machineable alloy in order to provide desired strength, wear or hardness qualities.

### Lead Addition Aids

Recent availability of many grades of steel with lead added to the normal analysis, has made lower costs possible on finished parts because of the increased machineability—even though the addition of lead increases the cost

of the metal used. Because of the poor machining qualities of basic low carbon steel, it is seldom wise economically, to specify its use in a screw machine part unless the addition of lead is authorized.

Since bar stock is used to make screw machine parts, it is best to design an item so that it can be conveniently produced from standard sizes of round, hexagon or square material. Fancy shapes should be avoided when possible to minimize the need for special tools and expensive unusual set-ups. In like manner, it is wisest to specify standard, rather than special, thread sizes and drilled hole sizes thus eliminating special gages, threading tools, drills and reamers.

### Avoid Unnecessary Finishing

To maintain the most satisfactory and economical results, NSMPA suggests that "users not specify closer tolerances than are absolutely necessary. It is true that extremely close tolerances can be held on screw machines, but it is not reasonable to increase manufacturing costs unless special circumstances warrant. When surfaces do not fit another part, it is wisest to specify diameters in fractions of an inch. Unnecessary finish, burring and concentricity requirements should be avoided in the interests of economy."

### Design Tips Given

The special NSMPA report went on to state that in designing a screw machine part, "one should allow as much extra depth as possible in blind holes to allow for chip clearance. Square bottom holes are naturally more difficult to produce and therefore more expensive."

Another point made is to allow the maximum distance possible between the end of a thread and the shoulder, or bottom, in the case of a tapped hole.

"Finally, the tooling costs of screw machine parts are low compared to the costs of patterns, molds or dies. Usually the costs

## CLEVELAND TRAMRAIL AUTOMATIC HANDLING SYSTEMS

Long Hauls • Heavy Loads  
Big Man-Hour Savings



### Robot materials handling systems are here

**R**OBOT materials handling systems are here. Cleveland Tramrail has a wide variety of them in use in many plants. Some operate inside, some outside; some between machines, departments, or building floors; some between distant plants (as illustrated above). Some carriers travel between two points; others serve as many as 126 stations.

Operators are not needed for robot carriers. Pressing a button sends a carrier on its way. At the delivery point it stops automatically. After unloading and reloading, pressing another button returns it to the original

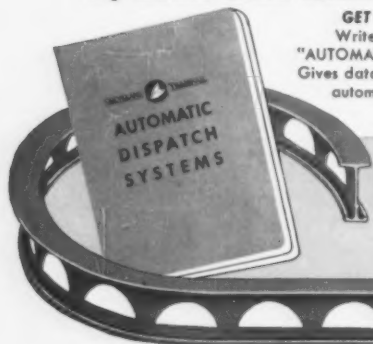
station or to some other station as selected.

Cleveland Tramrail automatic carrier systems are available for loads of 1000 lbs. to 10 tons. They will lift loads to heights of 100 feet, if necessary, and carry them for practically any distance. Some carriers even unload and return automatically.

The man-hour-saving possibilities that Cleveland Tramrail Automatic Handling Systems offer you are tremendous—and there are other important advantages. It will pay you to get acquainted with this rapidly spreading idea of materials handling.

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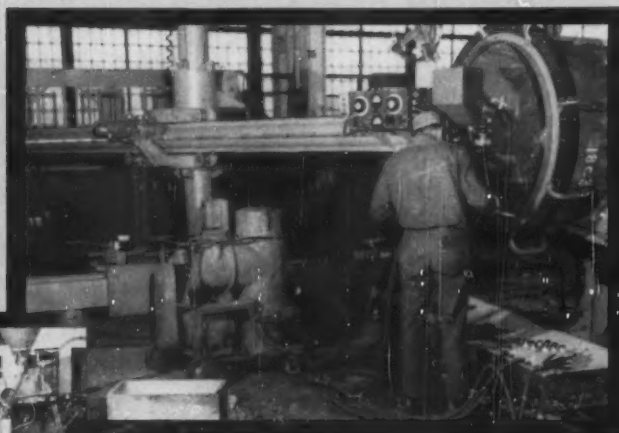
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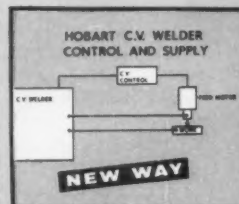
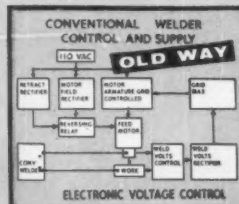
More and more plants are turning to automatic and semi-automatic welding operations to lower costs. The big swing to this new and faster welding is due to Hobart's "SIMPLIFIED" method of controls that eliminate elaborate installations and complicated, troublesome electronic and electrical controls.

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HOBART WELDERS

## PROOF of how to get dependable results welding by submerged arc

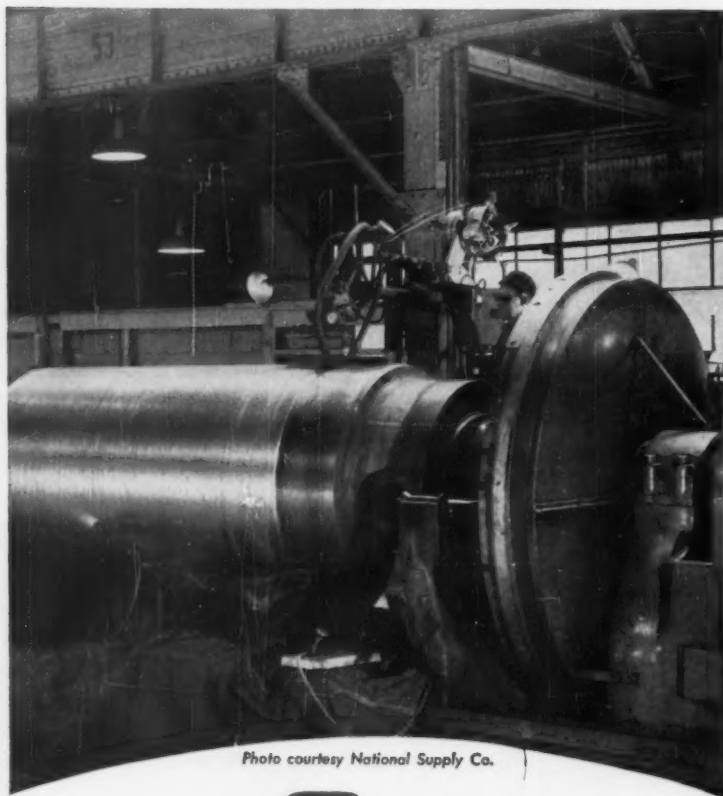


Photo courtesy National Supply Co.

WELD WITH **ARCOS** 

### CHROMAR Stainless COILED WIRE

Shown above is a 72,000 lb. Extrusion Ram being overlaid by submerged arc with type 316 stainless weld metal. At the conclusion of the job the entire extensive welded surface was reported sound and crack-free—the same results you can expect with Arcos Chromar Wire on your own jobs. Arcos control of the composition of its Chromar welding quality spooled wire assures a transfer of all the elements needed to produce top notch stainless welds—mechanically sound and long lasting in service. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



## TECHNICAL BRIEFS

of tooling and set-up are apportioned over the quantity produced. For this reason, it is always best to order as large a quantity as is reasonable to obtain the lowest cost per piece. Often the inventory increase is not as great as the extra cost of a smaller quantity."

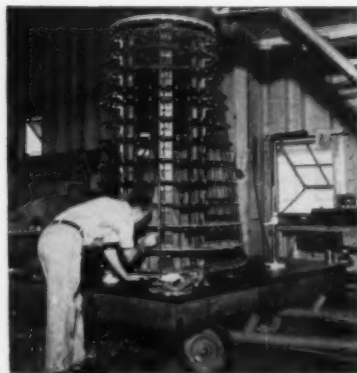
## Methods:

### Slip-squeeze nuts simplify mocking-up

A new type slip-squeeze nut has been designed to save thousands of man-hours in the construction of plaster models and mockups.

Developed at Convair (San Diego), a Division of General Dynamics Corp., the simple, but effective innovation promises to reduce costs substantially in the airframe industry alone.

Many thousands of nuts are used to align spline or hidden templates in the fabrication of plaster models and master tools. The small model illustrated required 1100 nuts to secure the entire template assembly. Many models require ten times this amount.



### Nuts align templates while the plaster is being applied.

The vertical rods shown installed are threaded  $\frac{1}{4}$ -20. A nut is required on each side of the templates wherever the rod passes through. These nuts align the templates and lock them in place while plaster is being applied.

It has been common shop practice to locate the standard nuts in their proper positions by gripping one end of the threaded rod in a drill motor. The rod was then revolved

while holding the nuts firmly. By using this time consuming method each nut was ultimately threaded to its desired position.

#### Located Immediately

The new type slip-squeeze nuts can be located immediately on any desired position on the rod, slipped into position and squeezed tight in one easy operation. A special tool is advisable to install the nuts. The pliers shown are a pair of reworked vise-grips which were used as a temporary tool for nut installation.

Slip-squeeze nuts can be produced with any desired perimeter and the thread size of any desired material. The nuts which are used on the  $\frac{1}{4}$ -20 rods are made with a  $\frac{5}{16}$ -20 thread and a  $\frac{1}{4}$ -in. slot. These are squeezed down to the  $\frac{1}{4}$ -20 size with the special pliers making a perfect  $\frac{1}{4}$ -20 nut.

## Electronics:

### Two digital computers share single problem

Data-processing shared by two interconnected electronic digital computers has been successfully performed at the National Bureau of Standards.

SEAC and DYSEAC, two high-speed computers designed and built at the Bureau, worked co-operatively on a common task to demonstrate program-controlled machine intercommunication in which coordinated programs were read into both machines. The problem simulated a situation where stock transaction reports are tabulated and summarized for fiscal accounting, and then forwarded for posting to inventory control records elsewhere.

#### Part of Navy Program

The experiments were carried out by the Bureau's data processing systems laboratory as part of a cooperative program with the Navy Bureau of Supplies and Accounts to investigate the application of electronic techniques to the problems of supply management. The experiments showed that two digital computers need not have identical operating characteristics to work together, pro-

## HOW TO GET WELDED SECURITY ON THE MOST CRITICAL JOBS

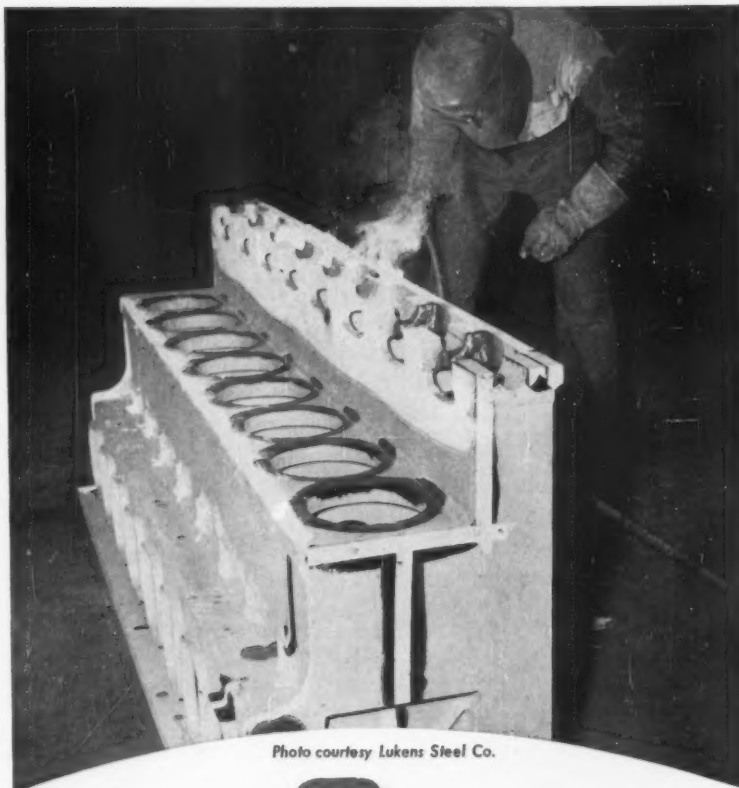
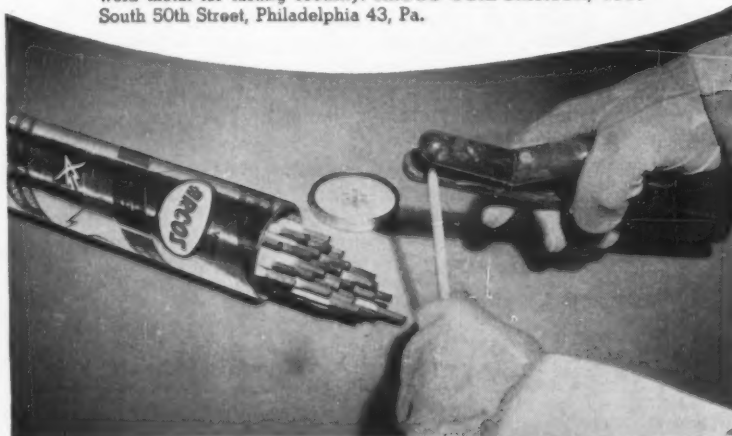


Photo courtesy Lukens Steel Co.

## WELD WITH **ARCOS**

### STAINLESS ELECTRODES

This Diesel engine housing—for use on a mine sweeper—is a new application for welded *stainless*. 18-8 stainless was selected for its non-magnetic properties. The unit, and many others, were completely welded with Arcos E308HC-15 low magnetic permeability coated electrodes. Why Arcos? For a reason you'll want to keep in mind: When base metal properties are critical . . . and performance requirements exacting, Arcos quality assures sound weld metal for lasting security. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



vided that one of them has the necessary control flexibility.

Typical applications of digital computers as data processors involve replacement of many small specialized machines by a single automatic system. However, for massive paper-handling operations, or for large-scale activities requiring the processing of the same data for different purposes at different locations, the use of more than one high-speed data

processor may be necessary.

For instance, in the far-flung supply organizations of the armed services, expediting flow of information is essential to efficient supply management. Automatic communication between machines has been foreshadowed by direct input and output provisions so that the computer continues with other useful work while transfers of information between it and external devices are in process, and by

tape-processing devices where search is under the program control of a computer.

DYSEAC was designed at the National Bureau of Standards for the Department of Defense to serve as the nucleus of a generalized feedback control network. This computer incorporated a number of operating features enabling it to respond automatically to information from remote external devices.

## YB MULTIFLAME Brazing Machines

Brazes  
Solders  
Anneals  
Hardens  
Tempers



Most Versatile  
Lowest Cost  
Highest Production  
Least Costly to Operate  
Easiest to Maintain

YB MULTIFLAME allows the use of unskilled labor. It can be fitted into any production line and is so flexible that it can, with a minimum of adjustment, handle pieces ranging from 0-10" wide to 0-30" high. Inexpensive additions to standard machine allows unit to be used for annealing, hardening or tempering.

YB MULTIFLAME improves quality, reduces rejects, cuts down on inspection time and allows for quality control. Minimum set-up and maintenance requirements and use of standard solders and flux together with a controlled operating speed means maximum output at minimum cost.

Youngberg Bros. Will **GUARANTEE** Your Production Rate

Write for further information.

# YB

## YOUNGBERG BROTHERS

261 Cherry St., Meriden, Connecticut

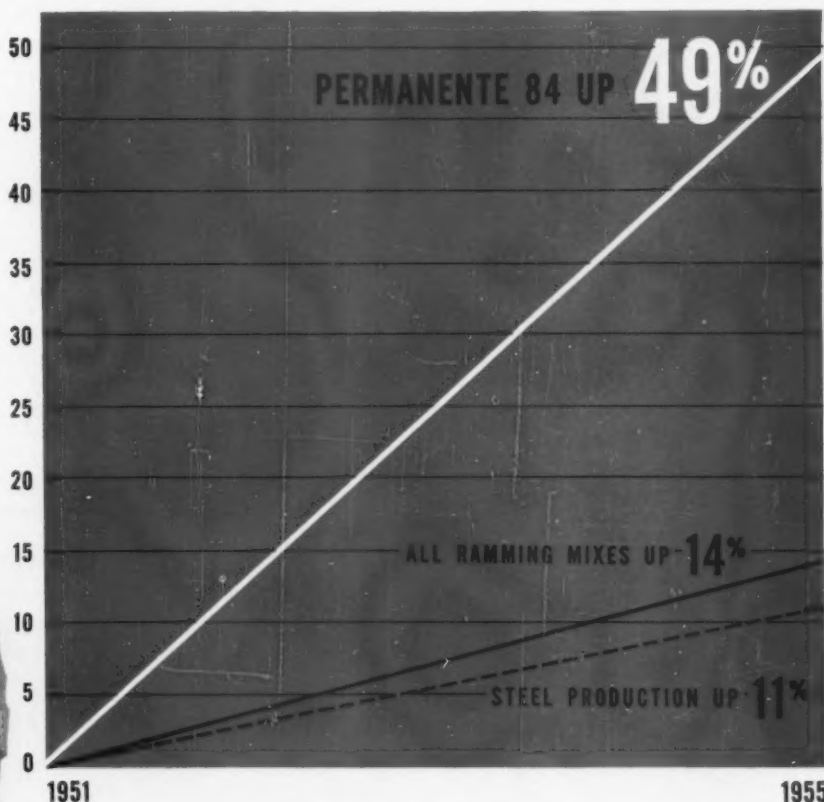
## New Films:

A new color slide film, produced by the Meehanite Metal Corp., presents the broad fundamentals of foundry art. It was prepared, states the sponsor, to furnish the engineer with a "series of basic design rules in order that he may avail himself fully of the advantages and economies in the use of cast to form metals." Film includes 52 frames on a 35 mm film-strip and is supplied with a long playing record. Runs 35 minutes. *Meehanite Metal Corp., 714 North Ave., New Rochelle, New York.*

"A Modern Fable," 20 minutes, 16 mm, is a sound-color movie based on the Clearing Machine Corp.'s line of automatic, transfer feed presses. Animations and direct camera work are used to explain the operation of a transfer feed press in detail. *Clearing Machine Corp. Div., U. S. Industries, Inc., Regional Advertising Dept., 6201 West 63rd St., Chicago 38.*

"The Tenant at 1010 Main," is a 32-minute, full-color film designed to dramatize the problems of electric power distribution in large commercial buildings. Produced as part of General Electric's More Power to America program, it traces the transformation of a building manager who discovers that scrimping on electrical systems 20 years ago is costing him tenants today. *Apparatus Sales Div., General Electric Co., Schenectady 5.*

More New Films p. 135



## Why this growing preference for Permanent 84 Ramming Mix!

As you can see from the chart above, sales of all ramming mixes to steel producers increased only 14% during the five year period ending December 31, 1955.

But during this same period, sales of Permanent 84 Ramming Mix increased a *whopping 49%*!

Why is Permanent 84 increasingly preferred by leading steel producers?

Briefly, here are the reasons:

Permanent 84 reduces the cost of maintaining furnace bottoms and banks. Repairs made with Perman-

ente 84 stay put! Down time for hot-repairs is reduced because repairs made with Permanent 84 last longer. Steel production goes up—costs come down. Ideal for hot patching both open hearths and electric furnace banks and bottoms.

Order Permanent 84 now, and get extra steel tonnage at lower cost.

Kaiser Chemicals Division, Kaiser Aluminum & Chemical Sales, Inc. Regional Sales Offices: 1924 Broadway, OAKLAND 12, California... 3 Gateway Center, PITTSBURGH, Pennsylvania... 518 Calumet Building, 5231 Hohman Avenue, Hammond, Indiana (CHICAGO).

Be sure to visit us at the Foundry Show, Atlantic City, May 3-9.

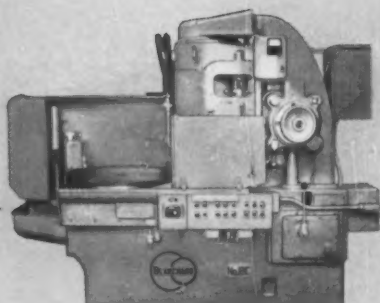


# Kaiser Chemicals

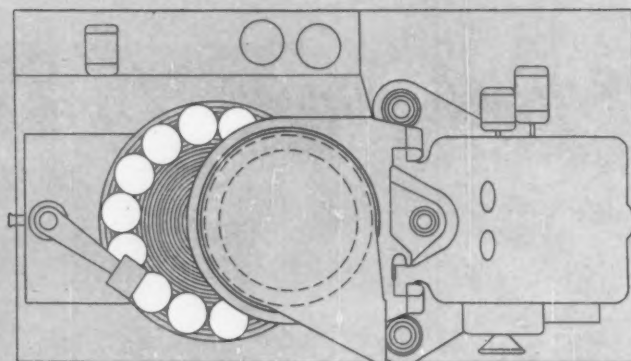
Pioneers in Modern Basic Refractories

Refractory Brick and Ramming Materials • Castables & Mortars • Magnesite • Periclase • Deadburned Dolomite

April 26, 1956

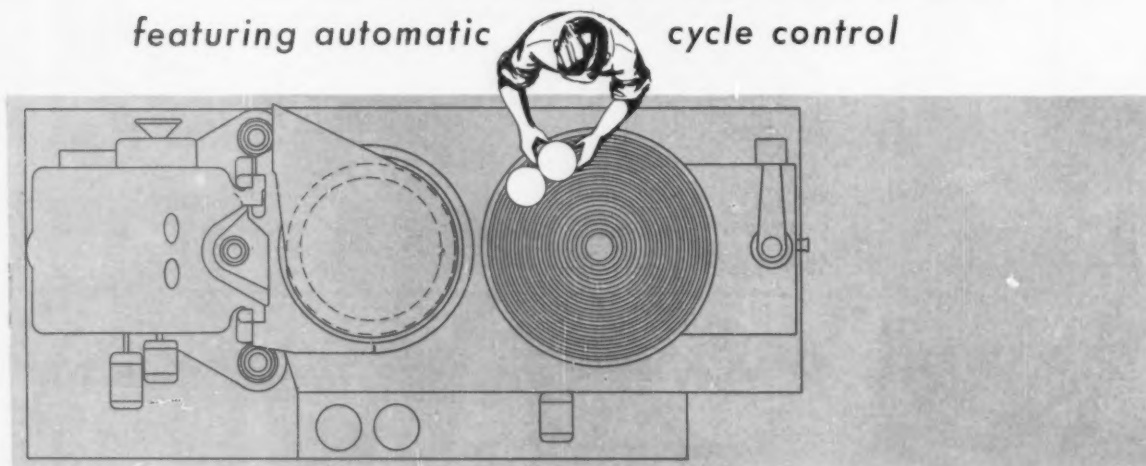


NO. 18-C BLANCHARD SURFACE GRINDER



## Plan for more profitable production with this new Blanchard Grinder

featuring automatic cycle control



This great new Blanchard has the speed and simplicity which guarantee economical grinding on a wide variety of jobs.

One operator can easily operate two of these automatic cycling surface grinders. By using the automatic cycle, he can unload, clean and reload one grinder while the other grinds automatically.

The automatic cycle does everything else: moves chuck (30" or 36" dia.) to grinding position and starts it rotating; starts wheel rotation

and coolant pump; provides rapid wheel approach to work; engages power down-feed at preset rate; changes to fine feed just before finished size is reached; stops feed when work is to size — "sparks" out; raises wheel head; stops wheel, coolant pump and chuck; moves chuck to loading position—demagnetizes chuck.

The No. 18-C also features: push button selection of manual or automatic operation; automatic size control; simple feed and head traverse controls; adjustable dwell timer.

*This new Blanchard offers you many new production advantages. Look into them today — write for free catalog showing work done on the No. 18-C.*

PUT IT ON THE **BLANCHARD**

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

## New Films:

"Data and Decision: Using Electronic Computers in Business," is a series of four 35 mm color-sound filmstrips designed to comprise a training course on electronic data processing. Each of the filmstrips is designed as a self-contained unit. Together, they constitute, states the producer—the American Management Association—a complete, non-technical program in electronic data processing, explaining how the computer evolved, how it works, how to plan it and how to use it. *Visual Education Dept., American Management Assn., 1515 Broadway, Times Square, New York 36.*

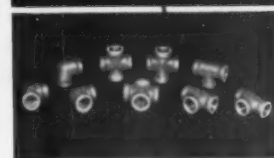
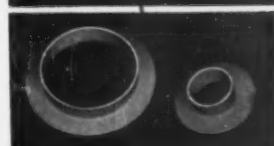
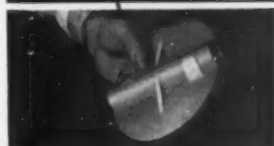
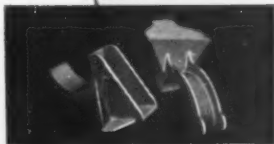
"Zinc Controls Corrosion," 35 minutes, 16 mm, is a sound and color picture which presents a demonstration of the general mechanism of corrosion as well as how zinc controls it. Produced by The American Zinc Institute, it uses animation and color to show how zinc controls corrosion of iron and steel by acting as a barrier and by affording galvanic protection. It then explains methods of coating



Galvanizing process is shown in film "Zinc Controls Corrosion."

steel stock or products with zinc, and surveys the various fields of usefulness for zinc-coated parts. The film describes continuous galvanizing lines, the hot dip galvanizing of large structural parts, and such means of corrosion prevention with zinc as cathodic protection, metallizing, sherardizing, and painting. *The American Zinc Institute, Inc., 60 East 42nd St., New York 17.*

look how —  
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reduces your  
production costs



**SAVINGS IN MACHINING COSTS** — Most machining operations can be simplified or eliminated entirely.

**SAVINGS IN MATERIAL** — Shellcast parts can be poured to dimensional tolerances of plus or minus 0.010" per inch. Sections less than 1/8" can be Shellcast. Tremendous savings in material are made possible.

...IMPROVE YOUR PRODUCT DESIGN WITH  
ESCO SHELLCAST PARTS

**SMOOTHER SURFACE — BETTER APPEARANCE** — if desired, castings may be buffed to satin or bright finishes without prior machining. You get a better looking, more saleable product.

**GOOD REPRODUCTION OF DETAIL** — Shellcast often reproduces lettering so well that a separate nameplate is no longer needed. Intricate details of design, defying normal foundry methods, can be Shellcast successfully.

**ESCO SHELLCAST IS A NEW CASTING TECHNIQUE** — that not only produces parts better, faster and at lower cost, but often makes substantial savings in basic production procedures. Smooth surfaces, with good reproduction of detail; uniform density, light weight... these are only a few Shellcast advantages that bring savings in materials, machine-finishing, and assembly. *ESCO Shellcast is available in all low alloy steels, stainless steels and high alloys.*

WRITE FOR  
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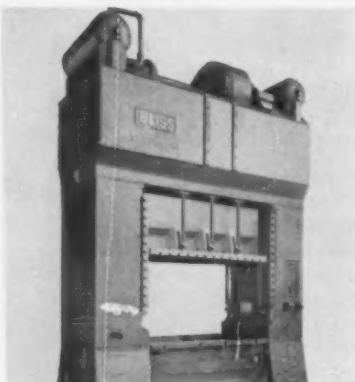
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( ) Have an application engineer call for an appointment.

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## NEW EQUIPMENT

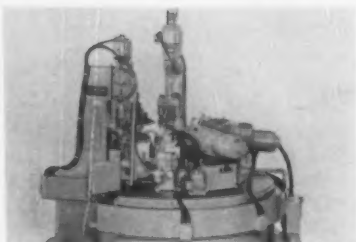
**New and improved production ideas, equipment, services and methods described here offer production economies... for more data use the free postcard on page 117 or 118.**



### **Press unit features left-to-right gear drive**

A new two-point enclosed press design incorporates an unusual left-to-right gear drive. It reportedly requires less floor space than previous front-to-back designs. Gear arrangement utilizes twin intermediate shafts which permit mounting the flywheel, clutch and motor drive in between. This is designed to make a compact drive system which is housed within a box crown that is symmetrical both right to left and front to back. Re-

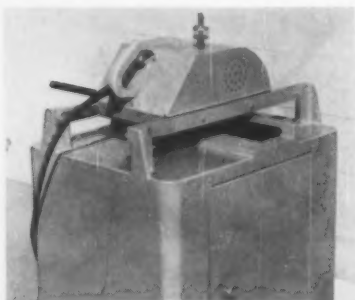
sult: less floor space needed. The press design is now being manufactured in cast Meehanite frames in capacities ranging from 150 to 750 ton. All are enclosed presses. Features include use of the maker's automation control (an electro-mechanical rotary switch); built-in lights over the die area; and automatic oil lubrication. Door and covers are flush-mounted as are buttons, controls. *E. W. Bliss Co.*  
For more data circle No. 34 on postcard, p. 117



### **Driller and miller handles 600 parts per hr**

This 12-station horizontal indexing drilling and milling machine is used to drill, tap, slot, straddle mill and broach nine different brass throttle shafts. Five cam feed drill units, one lead screw tapping unit and one air operated broach are used to process the parts. Four

drill units with milling attachments are mounted horizontally and one vertically. Parts are loaded in a V-block with hand screw clamp and automatically indexed through the processing cycle. *Hartford Special Machinery Co.*  
For more data circle No. 35 on postcard, p. 117



### **Cut saw for copper enables elimination of reaming**

This copper cut saw is described as the only unit which will cut copper without a burr on either the inside or the outside. Therefore, the maker states, reaming is unnecessary and each cut slips into the fitting without burring. From seven to eight pieces of  $\frac{3}{4}$  in. and  $\frac{1}{2}$  in. copper tubing can be cut at one time. A length indicator as-

ures accurate cutting. The unit can be easily operated. Power is supplied by any 110 v outlet without the need of special wiring. Made of aluminum for easy portability, the saw weighs approx. 90 lb. In tests, several thousand cuts were made before wheel sharpening. *Collins Machinery Corp.*  
For more data circle No. 36 on postcard, p. 117



### **Lathe produces multi-start threads automatically**

A high speed, single-point thread cutting machine which automatically cuts internal and external threads, right and left-hand, taper and multi-start, is equipped with a secondary gear box for producing multi-start threads automatically. It also features a multi-feed attachment which enables the opera-

tor to automatically duplicate 2, 3, 4 or 6 passes when cutting multi-start threads. Unit has a capacity up to 55 in. of actual thread length and will swing up to 12 in. in diameter. High working speeds are cited of up to 2000 rpm. *Man-Au-Cycle Corp. of America.*  
For more data circle No. 37 on postcard, p. 117



The sturdy Taylor Velocipede frame of 2-inch mild steel tubing is braze-welded on this fixture, with  $\frac{1}{8}$ -inch Anaconda-997 (Low Fuming) Bronze Welding Rod, using the oxyacetylene flame-fluxing process.

**"...quickest, most dependable, most economical..."**

"Braze Welding with Anaconda 997 (Low Fuming) Bronze Welding Rod is the most practical method of joining steel tubing," The Frank F. Taylor Co.



The strategically placed braze welds on Taylor Velocipedes have smooth contours, a good basis for a fine finish—and high strength to stand up in the hardest service. The Frank F. Taylor Co. also makes the famous Taylor-Tot, standard equipment in most young families.

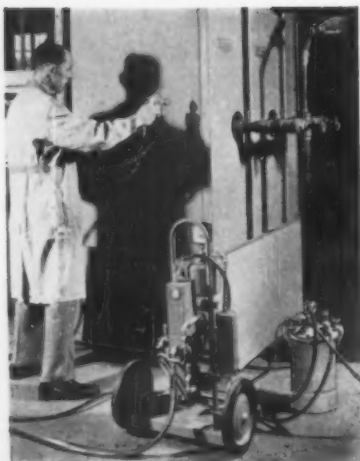
"By depositing smooth flowing and low fuming weld metal, Anaconda-997 (Low Fuming) Bronze Welding Rods promote faster, more uniform work—providing the quickest, most dependable, most economical method of joining steel tubing," says The Frank F. Taylor Company of Norwood, Ohio.

Anaconda 997 (Low Fuming) Bronze is a superior braze-welding rod widely used for the joining of steel, cast iron, and copper alloys by the oxyacetylene process. It is also used to deposit bearing surfaces on steel and iron. Anaconda Welding Rods are sold by distributors of welding equipment everywhere, such as O.K.I. Welding Company, Cincinnati, Ohio, which supplies The Frank F. Taylor Company.

See your Anaconda distributor for help in selecting the exact rod for your job. Or write for Publication B-13. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Company Ltd., New Toronto, Ont.

26108

**ANACONDA® WELDING RODS**



### Portable unit takes hot spray painting to job site

A portable paint heater takes direct to the job site the hot spray process. The unit is mounted on a two-wheel cart resembling a golf cart. With the heater, a painter can get a heavier film build since a greater amount of solid is deposited in a given area. Air consumption is cut considerably because lower atomizing pressures are used. The heaters are manufactured with either three or six kilowatt heaters. One three kilowatt model will operate on 115 v., while the other unit requires 230 v. service. Operation of these portable

units is similar to the conventional stationary installation. The portability feature provides for use of hot spray either indoors or out with the only requirement being an electrical outlet of the correct voltage. The material to be spray applied is heated in the heat exchanger where the transfer of heat from water to paint is effected. In the fluid hose to gun a heat jacket keeps temperature constant. Temperature of the water in the unit is controlled by the use of an adjustable thermostat. *DeVilbiss Co.*

For more data circle No. 35 on postcard, p. 117

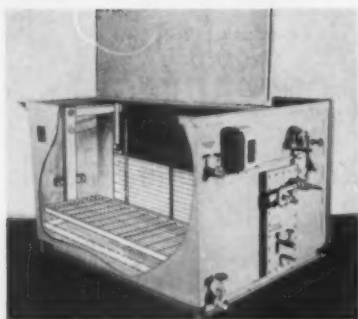


### Blind rivet gun made for varied lengths and diameters

This new blind rivet setting gun will handle all lengths and all diameters of aluminum, steel and monel Cherry rivets and Townsend commercial rivets. It is designed for operation with a standard  $\frac{1}{4}$  in. electric drill or  $\frac{1}{4}$  in. pneumatic drill. Blind rivets are set by a

pulling action. To operate, shaft is inserted in the  $\frac{1}{4}$  in. chuck. Gun is held in one hand, drill in the other and the pulling head slipped onto the rivet stem. Drill motor is started and a pushing action sets rivets. *Townsend Co.*

For more data circle No. 39 on postcard, p. 117

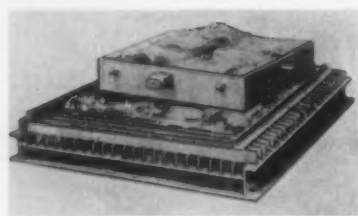


### Washers combine chemical action and work agitation

A new line of parts washing machines are designed to combine chemical action of the cleaner with mechanical action of work agitation to remove foreign matter thoroughly and fast. Built for heavy industrial operation, they incorporate a minimum number of moving parts to reduce wear. They are available to handle from 50 to

2500 lb and more per load. Each size comes steam, gas or electrically heated. They can be supplied not-heated for cold solvent cleaning. Drive parts are built away from fluid or travel of work. The linkage is simple with no obstruction to hamper operator. *American Machine and Solvents Co., Inc.*

For more data circle No. 40 on postcard, p. 117

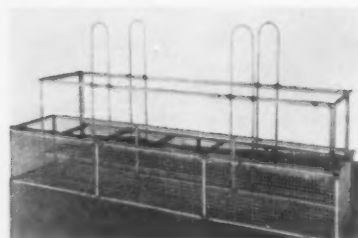


### Shake-out grids separate hot sand from castings

Powerful vibrations of these shake-out grids provide easy, fast separation of hot sand from castings. Available in 36 in. x 36 in. standard size, the grids can be custom-built for any application up to 10 ft square. They are constructed

of a rigid steel frame mounted on vibration dampeners. A vibrator is fastened beneath the grid, protected from the hot sand by metal shields. This assembly is usually mounted over a pit. *Syntron Co.*

For more data circle No. 41 on postcard, p. 117



### Degreasing basket holds heavy, extra long parts

This sturdy degreasing basket has been designed to hold heavy extra-long parts such as frames, shafts, and other long sections. Combining two sections, a basket and frame, with the basket being nested in the frame, it is described as holding a maximum number of pieces

in a minimum of space. The aim is to expose the largest possible surface area of each part to permit a good arrangement for draining. The frame is 11 ft x 29 in. x 33 in. deep; basket is 26 in. x 10 ft, 6 in. x 20 in. deep *Wiretex Mfg. Co.*

For more data circle No. 42 on postcard, p. 117

**"save 80%  
on welding  
gas costs  
with new  
MAGS\*  
process!"**

\*Metal Arc Gas  
Shielded Welding

## Liquid Carbonic's new all CO<sub>2</sub> gas method!

Save approximately 7c on every foot of shielding gas you use! LIQUID's new process uses low cost CO<sub>2</sub> (1½c or less per cu. ft.) in place of expensive argon or helium.

**New and broader uses.** By greatly reducing gas costs, the new Liquid Carbonic CO<sub>2</sub> method makes the advantages of shielded gas welding available for even "low budget" applications.

All carbon steels are now being welded successfully with this inexpensive new method.

**High quality, high speed welds.** Liquid Carbonic's new all CO<sub>2</sub> gas method produces welds of equal or superior quality to welds made with straight argon or helium.

**For use with both hand and automatic equipment.** Your present equipment can probably be used, either "as is" or with slight modifications.

**For highest performance** specify RED DIAMOND Welding Grade CO<sub>2</sub>. Specifically developed for gas shielded welding. Brought to you in specially marked 50 lb. (435 cu. ft.) cylinders.

© The Liquid Carbonic Corporation



**BOOTH 93  
WELDING  
SHOW**

See a live demonstration of both  
TIG\* and MAGS\* welding.

World's Largest Producer of

**THE LIQUID  
CARBONIC  
CORPORATION**



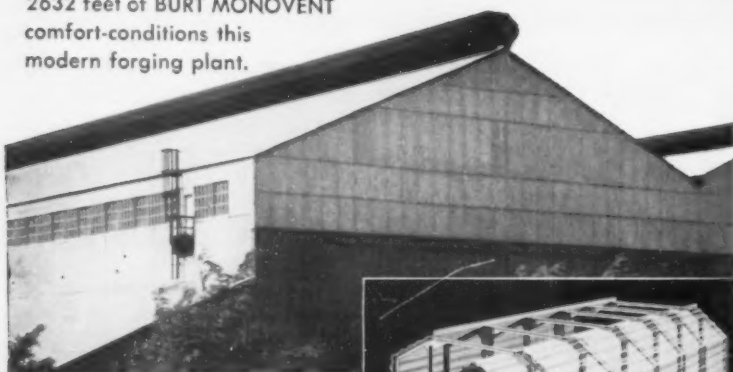
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For a descriptive folder  
in color as well as technical  
bulletin covering  
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3164 South Kedzie Avenue, Chicago 23, Illinois  
Please send me complete technical data on Liquid  
Carbonic's new CO<sub>2</sub> gas welding method.

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2632 feet of BURT MONOVENT  
comfort-conditions this  
modern forging plant.



**FOR ECONOMICAL  
VENTILATION IN  
HEAVY INDUSTRY**

## **BURT MONOVENT Continuous Ridge Ventilator Is Your BEST Buy!**

Where high heat or fumes require the removal of large volumes of air, Burt Monovent exhausts more air per dollar than any other ventilator. It provides uniform ventilation of the entire structure—in effect, converts the roof ridge to a quick-acting giant air valve. The Monovent is economical to install, operate and maintain and highly efficient.

- **INSTALLS ON ANY TYPE ROOF**
- **SIZES FROM 4" TO 96"**
- **STURDY CONSTRUCTION FOR LONG LIFE**
- **MINIMUM MAINTENANCE**



*Send for **FREE Data Book!***

Write for Burt Data Book SPV-101-E.  
It supplies quick data on Burt's complete line of modern Room Ventilators

**FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES**

# **The Burt Manufacturing Company**

920 So. High St.

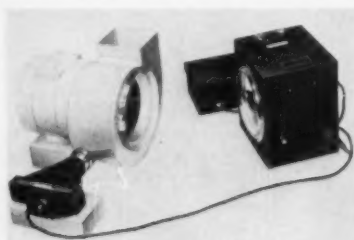
Akron 11, Ohio

MEMBER POWER FAN MANUFACTURERS ASSOCIATION

### **NEW EQUIPMENT**

#### **Balancing vibrometer**

This balancing vibrometer with built-in neon tube is described as making an economical balancing device when used with a stroboscope. Made in various sensitivities, it measures vibration amplitude and "high spot" on machines to be



balanced. It is available in bench models which exert a pressure of only 1 oz on the machine or in hand models with heavier pressure for stability. Hand models are adapted for either bearing or shaft measurements. *Vibroscope Co.*

For more data circle No. 43 on postcard, p. 117

#### **Drill feed attachment**

New improvement adds skip drilling as a standard operation of the automatic multi-speed drill feed attachment for drill presses, it is announced. At a touch of the foot pedal, maker states, it goes through the full cycle, making a fast ap-



proach, drilling at a set speed and depth, making another rapid approach, drilling at set speed and depth, and retracting to starting position. *General Pacific Corp.*

For more data circle No. 44 on postcard, p. 117

International Products & Mfg. Co.

switched to La Salle

**fatigue-proof**

STEEL BARS

## TO MAINTAIN UNIFORMLY HIGH QUALITY



NEWLY PUBLISHED!  
Get your copy of this 20-page  
booklet which gives detailed  
information on the remarkable  
new "FATIGUE-PROOF."



**La Salle STEEL CO.**

1436 150th STREET, HAMMOND, INDIANA

Manufacturers of America's Most Complete  
Line of Quality Cold-Finished Steel Bars

Please send me your "FATIGUE-PROOF" Bulletin.

name \_\_\_\_\_  
title \_\_\_\_\_  
company \_\_\_\_\_  
address \_\_\_\_\_  
city \_\_\_\_\_ zone \_\_\_\_\_ state \_\_\_\_\_

International Products & Manufacturing Company is now specifying "FATIGUE-PROOF" steel bars for generator and starter shafts. These are heavy-duty shafts. Formerly they used 4140 or 8640 heat-treated.

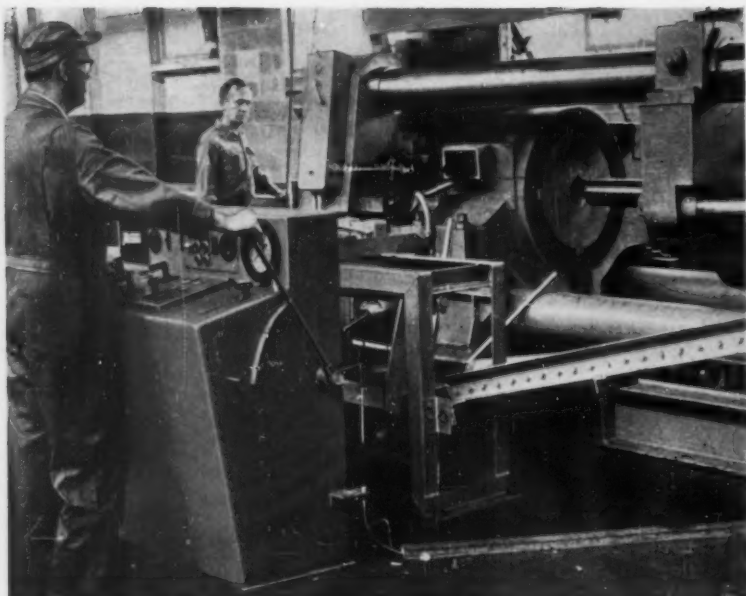
Field failures can be anticipated unless the finest of materials and the best of manufacturing practice are employed.

"FATIGUE-PROOF," by eliminating heat-treatment, does away with any possibility of quench cracked shafts getting past inspection. Since no straightening after heat-treatment is required, unfavorable residual stress due to severe straightening operations cannot be present.

It's another case where "FATIGUE-PROOF's" high strength in-the-bar eliminates a possible cause of trouble.

If you want to improve the quality of your products and avoid the problems of machining or heat-treating parts from high strength carbon or alloy steels . . . try a sample bar of "FATIGUE-PROOF." If you will give us application details, send a blueprint, or call La Salle Sales Engineer at REgent 4-7800, Chicago, Illinois, he will send you a test sample if it appears "FATIGUE-PROOF" can be used to your advantage.

*International Products & Manufacturing Co., of Chicago, are manufacturers of automotive starter and generator parts.*



## Watson-Stillman Extrusion Press BOOSTS PRODUCTION 20%

Until recently, Universal Converting Corp. of New Bedford, Mass., purchased all the tubing used in the manufacture of its aluminum furniture. Then, rapidly increasing demand for the company's "Delighter" line led to the installation of a Watson-Stillman, 1250-ton, aluminum extrusion press. Result: Production up at least 20% since installation.

The new press, which turns out tubing in diameters from 1/2" to 4", increases Universal's manufacturing flexibility. Simply by changing dies, press production is converted to the tubing size required to meet current needs. Furthermore, the press permits full quality control from raw aluminum billet to finished furniture.

This is one of the many ex-

amples of how Watson-Stillman extrusion presses are meeting the requirements of industry. The company offers a complete service . . . from press design and manufacture to final installation and operation.

Free booklet shown gives details of Watson-Stillman's broad line of aluminum extrusion presses, in capacities from 600 to 5,000 tons. Ask for bulletin 340B.

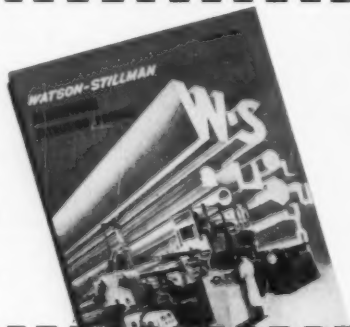
**WATSON-STILLMAN PRESS DIVISION**  
FARREL-BIRMINGHAM COMPANY, INC.  
162 Aldene Road, Roselle, New Jersey  
European Subsidiary:  
WATSON-STILLMAN INTERNATIONALE  
Maatschappij N. V., Groothandelsgebouw —  
Rotterdam — Holland



WS-9

**OTHER WATSON-STILLMAN EQUIPMENT**  
Forming, drawing, forging, trimming, hobbing, straightening and bending presses for the metalworking industry.

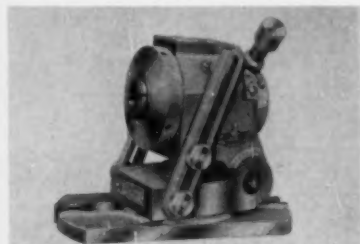
**FARREL ROLLING MILL MACHINERY**  
Rolls • Rolling Mills • Slab, Rod and Coil Handling Equipment • Universal Mill Spindles • Rod Coilers • Slitters • Gears • Mill Pinions • Pinion Stands • Gear Drives of Any Capacity • Flexible Couplings • Roll Grinding Machines • Roll Calipers



## NEW EQUIPMENT

### Dividing collet head

Illustrated universal dividing collet head is designed to permit fast, accurate indexing with the elimination of possible indexing error in milling, machining and grinding of parts. Eliminating a dividing head indexing plate with several



hundred holes, it uses, instead, interchangeable index plates available in a range of 2 to 36 spaces. This is designed to permit efficient operation and reduce opportunity for error to the minimum. Features a full 360° swivel of head on base. *Kuma Tool Co.*

For more data circle No. 45 on postcard, p. 117

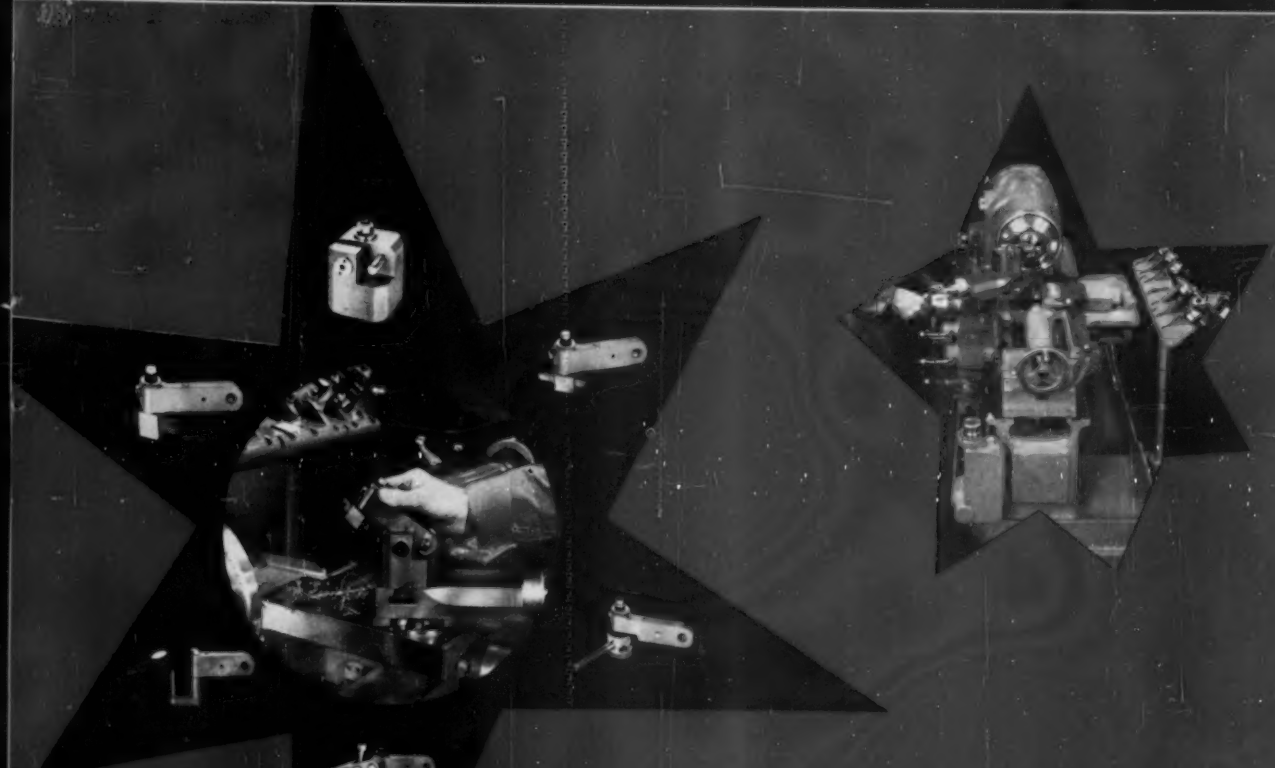
### Heavy duty bar racks

New, portable heavy duty bar racks are especially designed for safe, convenient handling and storing of piping and tubing. Design features act to prevent damage to stock of this nature in tiering and storing. Racks have a flush bottom and top.



In addition to full wrap around crane bars, an extra thickness of lift bar is welded to the racks for additional strength and safety. Convenience is stressed in the design for pickup and loading on trucks. *Palmer-Shile Co.*

For more data circle No. 46 on postcard, p. 117



*Click - and you've made a tool change!*

## Pre-Ground, Pre-Calibrated Monarch *Quik-Tool* Ready-Set Tooling Provides Immediate Tool Change

What's Quik-Tool? It's a tool block and set of seven tool holders, all precision ground and pre-calibrated to provide better accuracy of positioning and response than you get from any turret.

And it's fast! Tools automatically position themselves when slipped onto a locating pin and swung into the slot of the tool block. They don't even have to be aligned or clamped into position, as the precision fit of tool holder and tool block insures rigidity and accuracy.

Monarch Quik-Tools are specifically valuable in the toolroom or instrument shop for practically any type of turning, with tools used in any desired combination or sequence. The standard tool setups can be used, without adjustment to tool settings, for a wide variety of jobs. Holders are designed for standard tools and gages.

How about it? Don't you want to know *all* about how Monarch Quik-Tool eliminates lengthy setups and cuts tool change time to seconds? Send for our complete illustrated booklet today . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

Tool block fits any standard Monarch 10" Model EE Toolmaker's or Manufacturing Lathe compound rest "T" slot. Tools can be used in any combination or sequence for turning, boring, facing, chamfering, grooving, necking, threading, knurling, or cut-off. The tools automatically position themselves.



**Fill Out This Coupon and Clip to  
Your Business Letterhead, Please**

**THE MONARCH MACHINE TOOL CO.,  
SIDNEY, OHIO**

Please Send Me Your Illustrated Quik-Tool  
Booklet #306.

NAME \_\_\_\_\_

TITLE \_\_\_\_\_

# Foote

*...the leading supplier of*

**RAW MATERIALS  
for  
WELDING RODS  
COATINGS**

*and*

**STEEL ADDITIVES**

*including*

**ELECTROMANGANESE®**  
for stainless steel and alloy metals  
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for free-machining steel  
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for rimmed steel



**FOOTE MINERAL COMPANY**

450 Eighteen W. Chelton Bldg., Phila. 44, Pa.

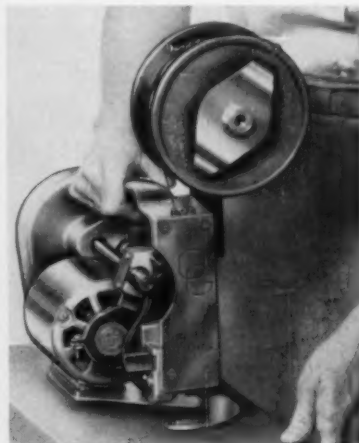
RESEARCH LABORATORIES: Berwyn, Pa.

PLANTS: Exton, Pa.; Kings Mountain, N.C.; Sunbright, Va.; Knoxville, Tenn.

**NEW EQUIPMENT**

**Wire stitcher**

This lightweight portable wire stitcher, which weighs 15 lb., is described as easily carried to any plant location. It is cited as eliminating the need to lift or carry cartons to a stationary top sealer. The unit makes about 200 stitches per minute on either single or



double fluted board, as well as on fiber, wood or leather. Optional equipment includes special arms for specific jobs, an open head for closing cartons; and it can be adapted to tacking with 0.020 x 0.030 in. or other dimension wire. *Ordinance Gauge Co.*

For more data circle No. 47 on postcard, p. 117

**Electro-magnetic clamp**

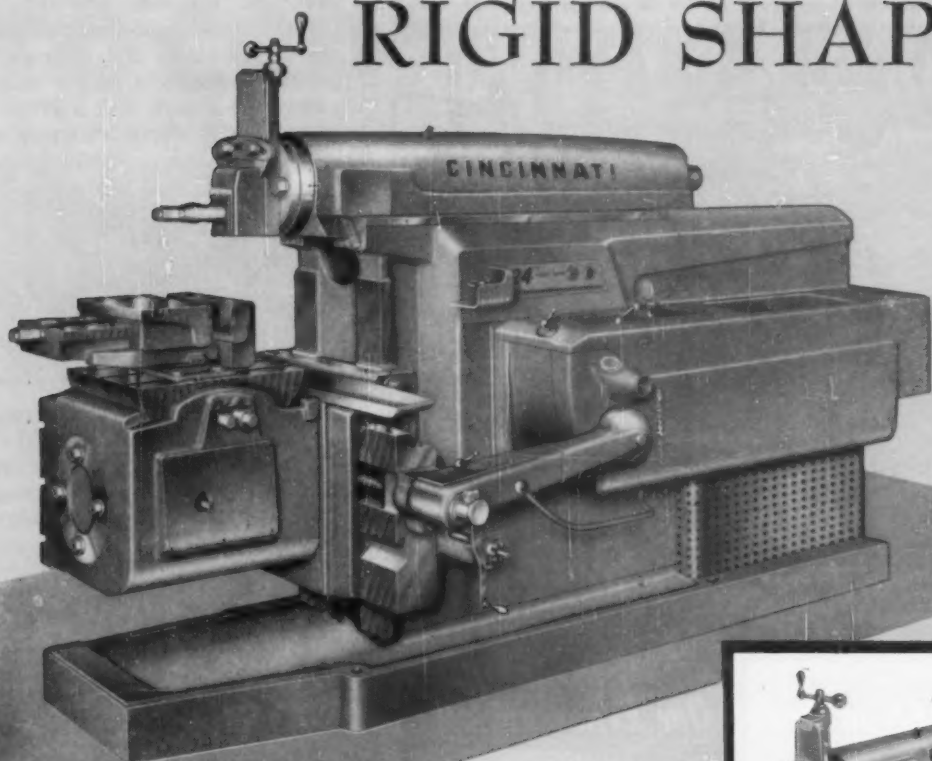
This electro-magnetic plate clamp has been designed to aid in industrial welding jobs. Equipped with a ratchet lever jack and a heavy duty (3000 lb) magnetic pull, the welding unit is recommended for many welding situ-



ations. One of its most important applications, the maker states, is use in plate alignment work for butt welding operations. *Portomag, Inc.*

For more data circle No. 48 on postcard, p. 117

# CINCINNATI RIGID SHAPERS



Cincinnati Shapers, Shears and Press Brakes carry a 5 year guarantee on workmanship and material—write for details.

New—modern—these Rigid Shapers offer faster, more convenient controls, greater accuracy, greater dependability. The New nodular iron ram, trunnion and vise, and wide, heavily ribbed column give a new rigidity—increase accuracy in cutting.

The New slot-free ram also eliminates the manual clamping of ram adjustment—a time saving feature.

A speedy, dependable electro-magnetic brake and clutch insure a faster performance.

50 P.S.I. pressure lubrication, exclusive on Cincinnati Shapers, is a real insurance against wear and a guarantee of long trouble-free performance.

Write for the circular on the New Rigid Shapers.



Nodular iron, slot-free ram



Electro-magnetic Clutch and Brake



The only shaper with  
50 P.S.I. lubrication

## THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

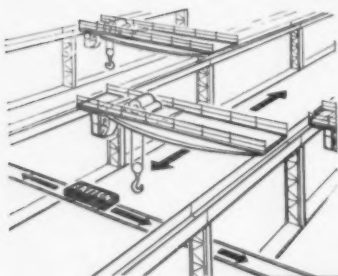
SHAPERS • SHEARS • BRAKES



# New CROSS-BAY®

## GASOLINE-HYDRAULIC TRANSFER CAR

to supplement overhead crane service in multiple bay plants, and for handling between plant buildings or storage and shipping areas,



**CUSTOM-BUILT** to meet speed and capacity requirements. Special superstructures can be designed for specialized or mechanized handling. The car illustrated, built for steel warehouse work, provides capacity of 25 tons plus 50% for impact loading, and two-way speed of 50 feet per minute. Other capacities available.

A-1048

CROSS-BAY cars may also be powered by electric motor, electro-fluid drive, gasoline-electric drive, or storage battery. Capacities from 5 to 500 tons. Custom-built.

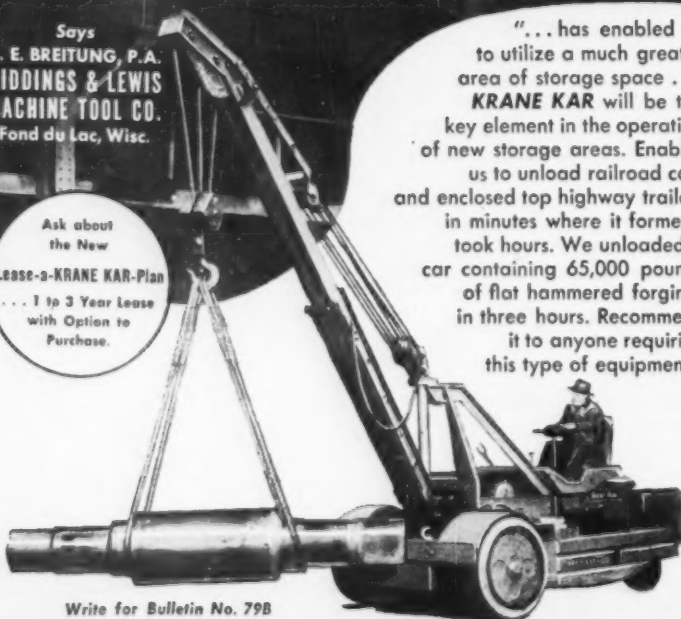
# EASTON®

EASTON CAR & CONSTRUCTION COMPANY • EASTON, PA.

## "KRANE KAR Exceeded Our Expectations,"

Says  
R. E. BREITUNG, P.A.  
GIDDINGS & LEWIS  
MACHINE TOOL CO.  
Fond du Lac, Wisc.

Ask about  
the New  
Lease-a-KRANE KAR-Plan  
... 1 to 3 Year Lease  
with Option to  
Purchase.



Write for Bulletin No. 79B

"... has enabled us to utilize a much greater area of storage space . . . KRANE KAR will be the key element in the operation of new storage areas. Enables us to unload railroad cars and enclosed top highway trailers in minutes where it formerly took hours. We unloaded a car containing 65,000 pounds of flat hammered forgings in three hours. Recommend it to anyone requiring this type of equipment."

"Silent Hoist" KRANE KAR Swing-Boom Mobile Crane . . . 1½, 2½, 5, 10, 12½ Ton Capacities

## SILENT HOIST & CRANE CO.

Pioneer Mfrs. of Heavy Duty Materials-Handling Equipment  
851 63rd Street, Brooklyn 20, N. Y.

## NEW EQUIPMENT

### Grinding controller

An electronic unit for automatic control of plunge grinders gages workpiece diameter continuously during grinding and uses the gaging information for automatic control of final size of the workpiece. When used with a grinder equipped with electrically-operated

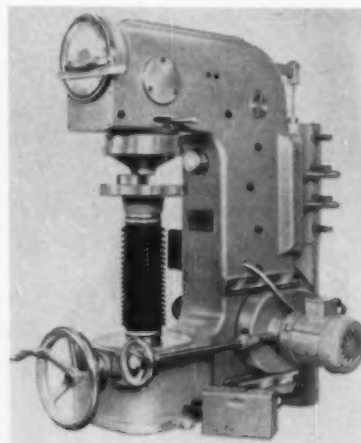


feed control and wheel withdrawal devices, the unit automatically controls such variables as the change from fast infeed to slow, amount of stock removal during sparkout, and wheel withdrawal at final size. Airborne Instruments Laboratory, Inc.

For more data circle No. 49 on postcard, p. 117

### Brinell tester

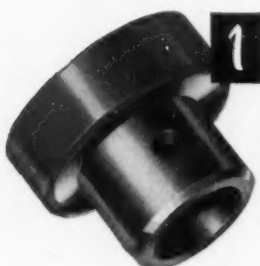
A motorized machine is available which automatically indicates the diameter of Brinell impressions in accordance with the standard Brinell method. In production, the



operator uses the machine like a "go-no gage." It is easy, the maker states, to tell whether the diameter of the ball impression lies between the pre-set limits. Loads are applied by dead weight. Gries Industries, Inc.

For more data circle No. 50 on postcard, p. 117

# 7 WAYS to SAVE MONEY with TOCCO\* Induction Hardening



1

Cost was reduced 94% when heat-treatment of this corn-harvester part was changed from carburizing to TOCCO-hardening, 9½¢ saved on every piece — \$4750 on each 50,000 piece batch, plus an hourly production increase from 120 to 300 pieces per hour.



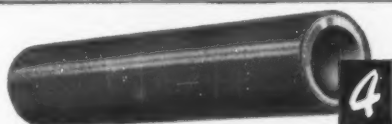
2

Leading automotive companies need and use TOCCO hardened axle shafts to handle higher horsepower. Better, yet cheaper—savings of \$375.00 per day. Less machining costs, lower priced material, increased production, and a plus in quality—200% greater torsional life.



3

Kearney & Trecker Corp. reduced the cost of hardening this milling machine part from \$1.57 to 10¢ apiece. In addition TOCCO made possible a switch from alloy to S.A.E. 1045 steel—saving another 11¢ per piece in material cost. Kearney & Trecker hardens 140 different parts on one TOCCO unit.



4

Thompson Products Ltd. boosted production of these automotive wrist pins from 500 to 1200 per hour when they switched to TOCCO-hardening. Costs fell from \$5.45 to \$3.25 per hundred parts—a savings of 2¢ per pin, \$26.40 per production hour.



5

Mechanics Universal Joint Division of Borg-Warner reports a 69% savings in the hardening of stub ends for propeller shafts. TOCCO also upped production from 35 to 112 parts per hour—over three times as fast as conventional heating methods.

Lima-Hamilton Corporation adopted TOCCO for hardening this shifting lever. Results: a savings of 4¢ per piece—\$25 per production hour. TOCCO costs only 17% of former heating method. This is only 1 of 139 parts TOCCO-hardened by Lima-Hamilton Corp. All show savings over usual heating methods.



6

Number 7—the lucky number—is up to you. Why not add your name to the list of companies who use TOCCO Induction Heating to increase production, improve products and lower costs. TOCCO engineers are ready to survey your plant for similar cost-saving results—without obligation, of course.

7

THE OHIO CRANKSHAFT COMPANY



**TOCCO**

NEW FREE  
BULLETIN

Mail Coupon Today

THE OHIO CRANKSHAFT CO.  
Dept. A-4, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

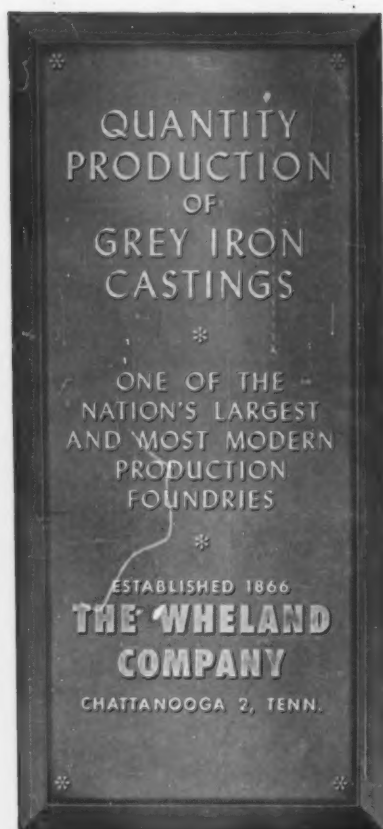
Name \_\_\_\_\_

Position \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



## STAMPINGS for the **FINISHED** **PRODUCT**



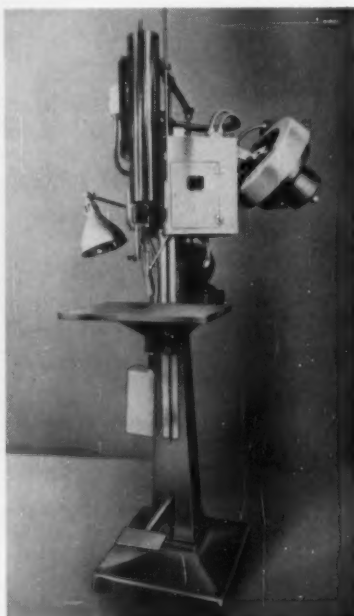
SEE SESSIONS... for Metal Specialties, Box & Case Hardware, Stamped Assemblies in a wide range of finishes.



290 RIVERSIDE AVENUE • BRISTOL, CONN.

### Automatic screw feeder

A new device for automatic hopper feeding of standard socket set screws is being introduced. The unit automatically feeds and positions socket set screws and is described as giving 100 pct feed to automatic power screwdrivers. Feed rates up to 2700 per hr are possible, the manufacturer states. The unit can feed socket set screws of various sizes, with only moderate



adjustments. Finger adjustments enable the operator to switch from one length to another, while it is only necessary to change a few feeder tubes to go from one diameter to another. The screws fed are standard socket set screws, without modifications of lead threads, point, or socket end. *The Bristol Co.*

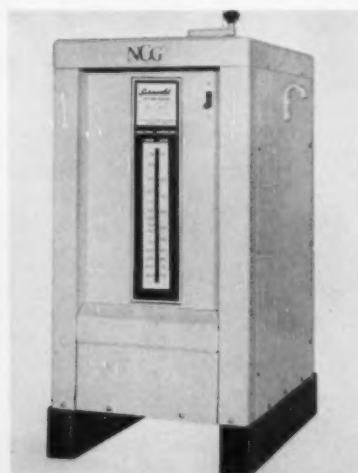
For more data circle No. 51 on postcard, p. 117

### Arc welders

Included in a company line of arc welders, numbering 10 different types and 98 models, are ac welders, dc rectifier welders, ac inert arc welders, combination ac-dc welders and portable engine-driven dc welders. The dc rectifier welder group has been expanded to include four different types: one for use in inert gas metal arc welding, one for maximum crater elimination, an-

### NEW EQUIPMENT

other featuring horizontal styling and single current range, and lastly a general purpose rectifier welder. A new portable air-cooled engine-driven dc unit is described as the lightest weight portable of its



capacity made. An ac industrial welder is made in 5 models with 60 pct duty cycle ratings of 200, 300, 400, 500 and 600 amp. *National Cylinder Gas Co.*

For more data circle No. 52 on postcard, p. 117

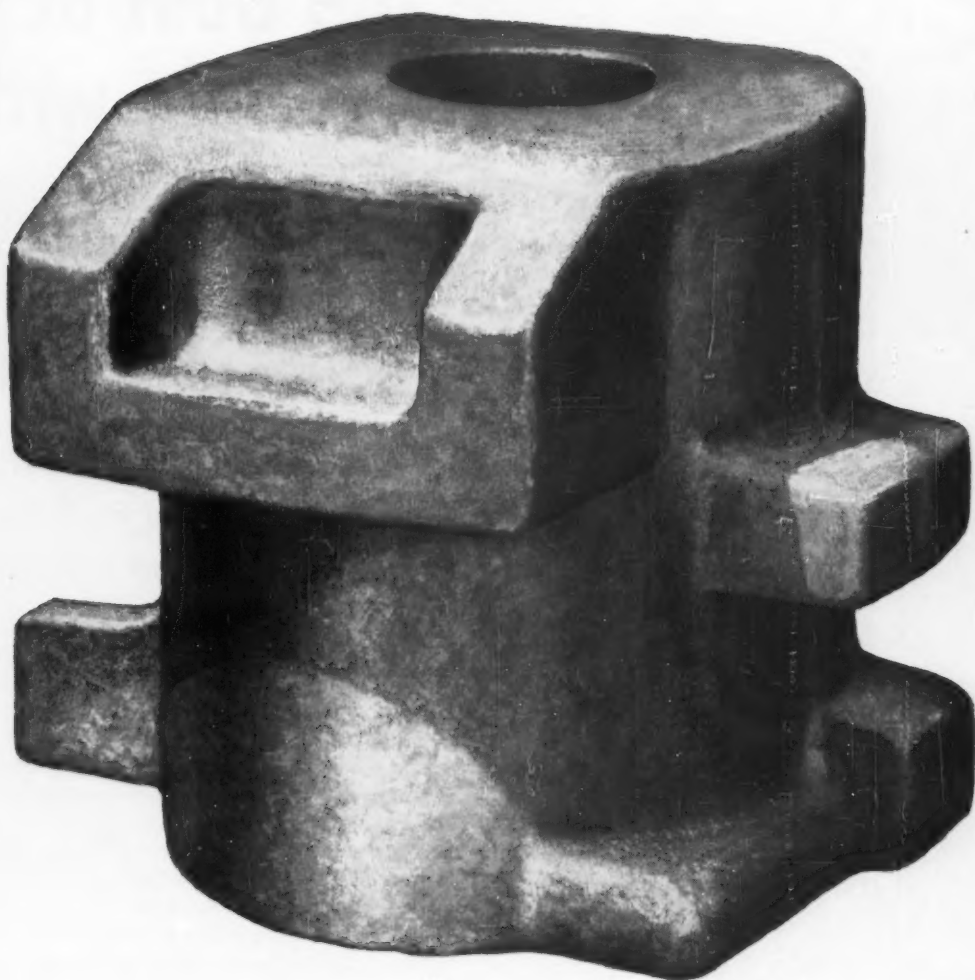
### Electronic controller

Designed for use with sensing elements, which are built into the gage heads, this controller has an overall accuracy of 2 pct using standard transducers. It is recom-



mended for installation on automatic measuring applications such as gaging and sorting, weighing, pressure control, fatigue testing, inspection and thickness control. Linear full scale displacement ranges of  $\pm 0.1$  in. to  $\pm 100$  micro-inches are incorporated in 20 scale divisions. Larger displacement ranges available. *Industrial Electronics, Inc.*

For more data circle No. 53 on postcard, p. 117



## **THIS WAS FORGED FOR ECONOMY**

Recent developments in steel forging techniques have made possible remarkable economic changes. Cameron Split-Die forgings of high quality alloy steel are produced in intricate shapes with both internal and external contours and in sizes from 200 to 5,000 pounds.

Many man-hours of production time are saved, machining difficulties are diminished and, of course, cost is reduced.

WRITE

*Cameron*

**IRON WORKS, Inc.**

SPECIAL PRODUCTS DEPARTMENT  
P. O. Box 1212, Houston, Texas

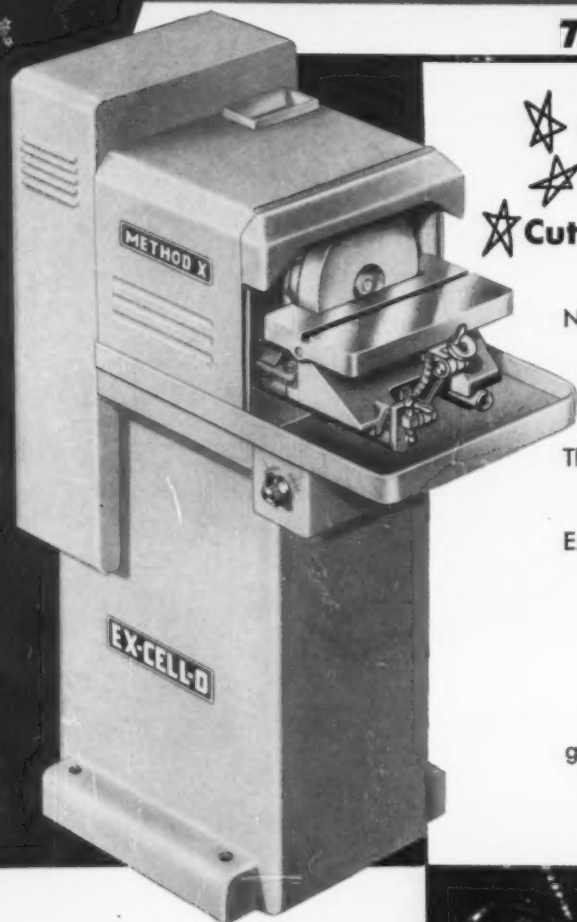


# Save the Cost of Diamonds with

## **EX-CELL-O Method X**

**TOOL**

**SHARPENER**



Style 43 Ex-Cell-O  
Method X Tool Sharpener.

Popular at the Show. At the Machine Tool Show, hundreds of men were impressed by this diamond-less tool sharpener that lengthens the life of carbide tools because it leaves NO heat checks, NO grinding cracks, and NO saw-tooth cutting edges.

- ★ Cuts any conductive material
- ★ Does both roughing and finishing
- ★ Cuts carbides and steel at the same time!

Now you can sharpen the hardest single-point tools without using diamonds or abrasive wheels. Using the electro-spark principal in off-hand sharpening, Ex-Cell-O Method X produces a non-directional matte finish with none of the abrasions caused by conventional grinding. The coarseness of texture and cutting speeds are controlled by an electric control switch. The "grinding wheel" is actually a 10" cast-iron disc which is rotated by an Ex-Cell-O precision spindle with inbuilt motor. A spark gap is maintained between the disc and work piece across which current pulsations jump to do the cutting. No coolant is required in the sharpening process.

After brief instruction, men with conventional grinding experience can readily adapt their skill to Method X. Get all the facts about this new cost-saving process—get in touch with your local Ex-Cell-O representative today.



# EX-CELL-O

**CORPORATION**

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION  
MACHINE TOOLS • GRINDING SPINDLES  
CUTTING TOOLS • RAILROAD PINS  
AND BUSHINGS • ORILL JO BUSHINGS  
AIRCRAFT AND MISCELLANEOUS PRO-  
DUCTION PARTS • DAIRY EQUIPMENT

## The Iron Age SUMMARY . . .

**Some producers concerned over outlook for third quarter . . . But despite automotive slowdown, other industry going strong . . . Scrap headed for Washington showdown.**

**Hot and Cold . . .** Biggest question mark in the steel market picture is the third quarter. Some steel people are blowing hot and cold over the prospects. They're worried over inventory build-ups as a hedge against price increases and the possibility of a strike.

But most of this looking-over-the-shoulder attitude is not justified. Despite the uncertainty over automotive, other major metalworking industries are moving toward expansion. These include construction, freight cars, oil and gas, appliances, and machinery. The steel expansion program alone has given a major shot in the arm to machinery and equipment manufacturers.

With or without a strike, steel production will slow down this summer. Maintenance is becoming an increasingly serious problem. And this situation will be compounded later on by vacations and the hot weather. Blast furnaces at some plants are being operated on borrowed time.

**Sheets Spotty . . .** The apparent easing in cold rolled and hot rolled sheets is scattered. Some consuming areas have been able to build inventory of cold rolled, but in the same areas, hot

rolled is being used as it comes from the mills. The situation in Detroit varies. Some carmakers are taking what they can get and screaming for more, while others are satisfied with their allotments.

Offsetting the situation in sheets is the crisis in plates and structurals. Even with imports, there's not enough of either product to go around. Many construction jobs have been delayed for lack of these two items. Oil country goods and linepipe are booked as far ahead as 1958. The wire market is moving into a seasonal strong period.

On an overall basis, new steel business is running from 20 to 35 pct above shipments despite high operating rates. Smart consumers are looking ahead to a strong fourth quarter.

**Scrap Hassle . . .** High steel scrap prices continued to plague consumers. And their resentment is spilling over into Washington, where Commerce and State departments are at loggerheads over exports. There have already been some sharp skirmishes in the capital in an attempt to relieve the pressure on steel firms which are paying through the nose on scrap purchases without compensating finished steel price increases.

### Steel Output, Operating Rates

	This Week	Last Week	Month Ago	Year Ago
<b>Production</b>				
(Net tons, 000 omitted)	2,462	2,462	2,425	2,316
<b>Ingot Index</b>				
(1947-1949=100)	153.3	153.3	151.0	144.0
<b>Operating Rates</b>				
Chicago	99.0	100.5*	93.5	99.5
Pittsburgh	103.0	104.0*	103.0	99.0
Philadelphia	105.0	106.0*	105.0	96.0
Valley	97.0	98.0	92.0	96.0
West	105.0	103.0*	100.0	96.0
Detroit	100.0	100.0	103.0	90.0
Buffalo	105.0	105.0	105.0	105.0
Cleveland	103.5	102.0	102.0	98.5
Birmingham	96.0	93.0	93.0	93.5
S. Ohio River	94.0	94.0*	85.5	93.0
Wheeling	98.0	102.0*	101.0	98.0
St. Louis	97.0	95.0	97.0	98.0
Northeast	93.0	93.0	90.0	104.0
<b>Aggregate</b>	100.0	100.0	98.5	96.0

\*Revised

### Prices At A Glance

(cents per lb unless otherwise noted)

	This Week	Week Ago	Month Ago	Year Ago
<b>Composite price</b>				
Finished Steel, base	5.179	5.179	5.179*	4.797
Pig Iron (Gross Ton)	\$60.29	\$60.29	\$57.71	\$56.59
Scrap, No. 1 hvy (gross ton)	\$55.50	\$55.50	\$52.50	\$35.67
<b>Nonferrous</b>				
Aluminum ingot	25.90	25.90	25.90	23.20
Copper, electrolytic	46.00	46.00	46.00	36.00
Lead, St. Louis	15.80	15.80	15.80	14.80
Magnesium	34.50	34.50	33.25	29.25
Nickel, electrolytic	64.50	64.50	64.50	67.67
Tin, Straits, N. Y.	98.875	99.50	99.00	91.50
Zinc, E. St. Louis	13.50	13.50	13.50	12.00

## Sheet Market Looks Easier

**But don't get the idea that tonnages are easy to come by . . . Situation varies by areas, and even auto firms are blowing hot and cold . . . Plates are still tough.**

◆ **SHEET MARKET** is reported easing in some areas in terms of space for third quarter delivery. But it isn't that easy. Some auto companies are taking their latest allotments and screaming for more. Others seem to be satisfied with what they are handed.

Cold-rolled sheets appear to be easier than hot-rolled in some areas. In Chicago, for example, inventories of cold rolled are reported building up, but hot-rolled tonnages are being consumed as fast as they arrive from the mills.

The situation in plates and structurals has arrived at the emergency stage. Many construction projects are being delayed for lack of structurals, and the tight plate market has had a bad effect on the freight car building program and in other fields.

Meanwhile, Armco Steel Corp. announced it is building a plant at Kansas City to manufacture aluminum coated wire.

"There is a very large market for this product for fencing and for use in many manufactured articles," says W. W. Sebald, Armco president. "It will have a longer life than other steel wire on the market today."

Mr. Sebald also announced that the company has invented a new type of automobile valve steel suitable for high compression motors.

J. L. Mauthe, president of Youngstown Sheet & Tube Co., has announced the company will spend an additional \$20 million expanding and modernizing its Mahoning Valley operations. This raises the total of planned spending for these plants to \$60 million.

**SHEET AND STRIP . . .** Cleveland producers are puzzled by the varying attitudes of the auto companies. Some

car makers seem to be satisfied with allotments while others are crying for more. In expediting their own capacity expansion, some mills are losing sheet production through rolling of light plate on the mills; also cold rolled sheet tonnages are being horse-traded for light and heavy structurals produced by other companies. **Detroit** mills are sold out through second quarter; no automotive business placed for third quarter. **Chicago** reports inventories of cold rolled building up among scattered list of consumers; but hot rolled is being used up as fast as it comes from the mills; carryovers on both products expected to be about four weeks at close of second quarter.

**BARS . . .** **Chicago** mills are operating at capacity, with backlog of two months; reinforcing bar "out of sight" and reroller rebar stymied by growing shortages of reroller rail. Forging bars continue scarce in **Detroit**, where demand for carbon bars continues good; alloy bars in best supply. Cold finishers are doing better in **Pittsburgh** following a period of relative easiness.

**PLATE AND STRUCTURALS . . .** **Detroit** market extremely tight; heavy plate and wide flange beams in strongest demand. Virtually impossible for new customers to get on the books anywhere. Premium-priced imports

helping some, but emergency cases are commonplace. Freight car building and construction programs being delayed by extreme shortage.

**WIRE . . .** Despite unhealthy situation in barbed wire, nearly every wire mill in the **Chicago** area is operating at capacity; manufacturers' and spring wire in strong demand, as well as fastener stock, with some concern being expressed over third quarter supplies. **Detroit** finds business holding up well for manufacturing grades; spring wire in strongest demand; merchant wire market improving.

**PIPE AND TUBULAR . . .** In **Chicago**, mills report a four-to-six-week carryover on seamless and electric-weld; mills will be able to fill third quarter books within a week after opening; although linepipe producers are booked into late 1957 generally and some as far ahead as 1958, small quantities of small diameter sizes are available for delivery this year. Situation generally tight in keeping with oil field activity and pipeline construction. Butt-weld pipe now being quoted on a month-to-month basis by **Cleveland** mills for July delivery, but some rolling time open in May and June. In **Pittsburgh**, most sizes and grades of pipe are still tight; one producer says his customers would have trouble getting delivery in 1957 on some types of seamless. Youngstown Sheet & Tube Co. increasing prices on Yaloy steel pipe 7 pct at Youngstown and Indiana Harbor.

**WAREHOUSE . . .** Some large **Cleveland** warehouses are screening orders from customers to sidetrack substitutions; in many cases customers are willing to pay extras of \$1.25-1.50 per ton for special chemistry or other extras which they normally do not require; most houses in **Cleveland** about cleaned out on standard plate, structurals, and other hard-to-get items; only off-the-shelf products are cold finished bars, alloys, and stainless. In **Chicago**, a feverish scramble is on to build up some inventory, which is meeting with success except in cold rolled sheet.

**INDUSTRIAL FASTENERS . . .** Production of all types is as near capacity as available steel will permit; most are in relatively easy supply and demand except in smaller automotive sizes which are very tight. Mine bolts have shown a big pickup; railroad fasteners and track bolts at capacity production with a ready market.

### Purchasing Agent's Checklist

**STEEL EQUIPMENT:** Steel expansion brings order boom to equipment makers. Backlogs lengthen . . . p. 55

**SCRAP:** What's behind record price levels? . . . p. 57

**POWDER METALS:** New uses grow . . . p. 62

# Comparison of Prices

(Effective April 24, 1956)

Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.

Price advances over previous week are printed in Heavy Type; declines appear in *Italics*.

	Apr. 24 1956	Apr. 17 1956	Mar. 27 1956	Apr. 26 1955
<b>Flat-Rolled Steel: (per pound)</b>				
Hot-rolled sheets	4.325¢	4.325¢	4.325¢	4.05¢
Cold-rolled sheets	5.325	5.325	5.325	4.95
Galvanized sheets (10 ga.)	5.55	5.55	5.55	5.45
Hot-rolled strip	4.325	4.325	4.325	4.05
Cold-rolled strip	6.25	6.25	6.25	5.79
Plate	4.52	4.52	4.52	4.225
Plates, wrought iron	10.40	10.40	10.40	9.30
Stainl's C-R strip (No. 302)	44.50	44.50	44.50	41.50
<b>Tin and Terneplate: (per base box)</b>				
Finplate (1.50 lb.) cokes	\$9.05	\$9.05	\$9.05	\$9.05
Finplate, electro (0.50 lb.)	7.75	7.75	7.75	7.75
Special coated mfg. ternes	7.85	7.85	7.85	7.85
<b>Bars and Shapes: (per pound)</b>				
Merchant bars	4.65¢	4.65¢	4.65¢	4.30¢
Cold finished bars	5.90	5.90	5.90	5.40
Alloy bars	5.65	5.65	5.65	5.075
Structural shapes	4.60	4.60	4.60	4.25
Stainless bars (No. 302)	38.25	38.25	38.25	35.50
Wrought iron bars	11.50	11.50	11.50	10.40
<b>Wire: (per pound)</b>				
Bright wire	6.60¢	6.60¢*	6.25¢	5.75¢
<b>Rails: (per 100 lb.)</b>				
Heavy rails	\$4.725	\$4.725	\$4.725	\$4.45
Light rails	5.65	5.65	5.65	5.35
<b>Semifinish Steel: (per net ton)</b>				
Revoling billets	\$68.50	\$68.50	\$68.50	\$64.00
Slabs, reolling	68.50	68.50	68.50	64.00
Forging billets	84.50	84.50	84.50	78.00
Alloy blooms, billets, slabs	96.00	96.00	96.00	85.00
<b>Wire Rod and Skelp: (per pound)</b>				
Wire rods	5.025¢	5.025¢	5.025¢	4.675¢
Skelp	4.225	4.225	4.225	3.90
<b>Finished Steel Composite: (per pound)</b>				
Base price	5.179¢	5.179¢	5.179¢*	4.797¢

## Finished Steel Composite

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.

## Pig Iron Composite

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

## Steel Scrap Composite

Average of No. 1 heavy melting steel scrap delivered to consumers at Pittsburgh, Philadelphia and Chicago.

## Pig Iron: (per gross ton)

	Apr. 24 1956	Apr. 17 1956	Mar. 27 1956	Apr. 26 1955
Foundry del'd Phila.	\$65.26	\$65.26	\$64.26	\$61.19
Foundry Valley	60.50	60.50	60.50	56.50
Foundry, Southern Cin'ti	62.93	62.93	62.93	60.48
Foundry, Birmingham	55.00	55.00	55.00	52.88
Foundry, Chicago	60.50	60.50	59.00	56.50
Basic del'd Philadelphia	61.48	61.48	63.73	60.27
Basic, Valley furnace	60.00	60.00	60.00	56.00
Malleable, Chicago	60.50	60.50	59.00	56.50
Malleable, Valley	60.50	60.50	59.00	56.50
Ferromanganese, cents per lb.	9.50†	9.50†	9.50†	9.50†

† 74.75 pct Mn base.

## Pig Iron Composite: (per gross ton)

Pig iron	\$60.29	\$60.29	\$59.71	\$56.59
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## Scrap: (per gross ton)

No. 1 steel, Pittsburgh	\$56.50	\$56.50	\$53.50	\$35.50
No. 1 steel, Phila. area	55.50	55.50	53.00	37.00
No. 1 steel, Chicago	54.50	54.50	51.00	34.50
No. 1 bundles, Detroit	53.50	53.50	46.50	29.00
Low phos., Youngstown	62.50	61.50	59.50	36.50
No. 1 mach'y cast, Pittsburgh	58.50	58.50	57.50	43.50
No. 1 mach'y cast, Philadel'a.	58.50	58.50	56.50	44.50
No. 1 mach'y cast, Chicago	57.50	57.50	55.50	47.00

## Steel Scrap Composite: (per gross ton)

No. 1 heavy melting scrap	\$55.50	\$55.50	\$52.50	\$35.67
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## Coke, Connellsville: (per net ton at oven)

Furnace coke, prompt	\$14.50	\$14.50	\$14.25	\$13.00
Foundry coke, prompt	17.50	17.50	16.25	16.75

## Nonferrous Metals: (cents per pound to large buyers)

Copper, electrolytic, Conn.	\$46.00	\$46.00	\$46.00	\$36.00
Copper, Lake, Conn.	46.00	46.00	46.00	36.00
Tin, Straits, New York	98.875†	99.50	99.00	91.50
Zinc, East St. Louis	13.50	13.50	13.50	12.00
Lead, St. Louis	15.80	15.80	15.80	14.80
Aluminum, virgin ingot	25.90	25.90	25.90	23.20
Nickel, electrolytic	64.50	64.50	64.50	67.67
Magnesium, ingot	34.50	34.50	33.25	29.25
Antimony, Laredo, Tex.	33.00	33.00	33.00	28.50

† Tentative. ‡ Average. \* Revised.

## PIG IRON

Dollars per gross ton, f.o.b., subject to switching charges.

## STAINLESS STEEL

Base price cents per lb. f.o.b. mill

← To identify producers, see Key on P. 164 →

Producing Point	Basic	Fdry.	Mail.	Bess.	Low Phos.
Bethlehem B3	62.00	62.50	63.00	63.50	.....
Birdsboro, Pa. B6	62.00	62.50	63.00	63.50	.....
Birmingham R3	54.50	55.00*	.....	.....	.....
Birmingham W9	54.50	55.00*	59.00	.....	.....
Birmingham U4	54.50	55.00*	59.00	.....	.....
Buffalo R3	60.00	60.50	61.00	61.50	.....
Buffalo H1	60.00	60.50	61.00	61.50	.....
Buffalo W6	60.00	60.50	61.00	61.50	.....
Chesler C17	62.00	62.50	63.00	.....	.....
Chicago J4	60.00	60.50	60.50	61.00	.....
Cleveland A5	60.00	60.50	60.50	61.00	65.00†
Cleveland R3	60.00	60.50	60.50	61.00	.....
Dunkirk T4	60.00	60.50	60.50	61.00	65.00
Erie J4	60.00	60.50	60.50	61.00	65.00
Everett M6	60.00	62.50	63.00	.....	.....
Fontana K1	67.50	68.00	.....	.....	.....
Geneva, Utah C7	60.00	60.50	.....	.....	.....
Granite City G2	61.90	62.40	62.90	.....	.....
Hubbard Y1	.....	.....	60.50	.....	.....
Lane Star L3	.....	55.00	.....	.....	.....
Midland C11	60.00	.....	.....	.....	.....
Minneapolis C5	62.00	62.50	63.00	.....	.....
Monessen P6	60.00	.....	.....	.....	.....
Neville Is. P4	60.00	60.50	60.50	61.00	65.00†
N. Tonawanda T1	.....	60.50	61.00	61.50	.....
Pittsburgh U1	60.00	.....	60.50	61.00	.....
Shaville S3	60.00	60.50	60.50	61.00	.....
So. Chicago R3	60.00	62.50	63.00	63.50	68.00
Steeltown B3	62.00	62.50	63.00	63.50	.....
Swedeland A2	62.00	62.50	63.00	63.50	.....
Taleida I4	60.00	60.50	60.50	61.00	.....
Troy, N. Y. R3	62.00	62.50	63.00	63.50	68.00
Youngstown Y1	.....	60.50	61.00	.....	.....

**DIFFERENTIALS:** Add, 50¢ per ton for each 0.25 pct silicon or portion thereof over base (1.75 to 2.25 pct except low phos., 1.75 to 2.00 pct) 50¢ per ton for each 0.50 pct manganese or portion thereof over 1 pct, \$2 per ton for 0.5 to 0.75 pct nickel, \$1 for each additional, 0.25 pct nickel.

\* Add \$1.00 for 0.31-0.69 pct phos. † Intermediate low phos. Silvery iron Buffalo, H1, \$68.75; Jackson, J1, G1, \$47.50. Add \$1.25 per ton for each 0.50 pct silicon over base (\$8.1 to \$50 pct) up to 17 pct. Add 75¢ for each 0.50 pct manganese over 1.0 pct. Bessemer ferroalloy prices are \$1 over comparable silvery iron.

Product	301	302	303	304	316	321	348	410	416	430
Ingot, reolling	17.75	19.00	—	20.25	31.50	25.00	33.75	15.00	—	15.25
Slabs, billets, reolling	22.25	24.75	26.75	26.00	40.25	32.00	43.00	19.50	—	19.75
Forg. discs, die blocks, rings	—	—	—	—	—	—	—	—	—	—
Billets, forging	31.75	32.00	34.75	33.75	51.25	38.25	51.00	25.50	26.00	26.00
Bars, wires, structural	38.00	38.25	41.00	40.25	60.75	45.25	60.00	30.50	31.00	31.00
Plates	40.00	40.25	42.75	43.00	64.00	49.25	64.75	31.75	32.25	32.25
Sheets	44.25	44.50	52.25	47.25	68.25	54.25	73.50	36.25	—	36.75
Strip, hot-rolled	32.00	34.50	—	37.25	58.25	44.25	50.75	—	—	—
Strip, cold-rolled	41.00	44.50	—	47.25	68.25	54.25	73.50	36.25	—	36.75

## STAINLESS STEEL PRODUCING POINTS:

Sheets: Midland, Pa., C11; Brackenridge, Pa., A3; Butler, Pa., A7; McKeesport, Pa., U1; Washington, Pa., W2. (2.25¢ lower on Type 430) J2; Baltimore, Et; Middletown, O., A7; Massillon, O., R3; Gary, U1; Bridgeville, Pa., U2; New Castle, Ind., J2; Ft. Wayne, J4; Philadelphia, D5.

Strip: Midland, Pa., C11; Cleveland, A5; Carnegie, Pa., S9; McKeesport, Pa., F1; Reading, Pa., C7; Washington, Pa., W2; W. Leeburg, Pa., A3; Bridgeville, Pa., U2; Detroit, A2; Canton-Massillon, O., R3; Middletown, O., A7; Harrison, N. J., D3; Youngstown, C3; Sharon, Pa., S1; Butler, Pa., A7; Wallingford, Conn., U3 (2.5¢ per lb higher); W1 (2.5¢ per lb higher); New Bedford, Mass., A6.

Bar: Baltimore, A7; Duquesne, Pa., U1; Munhall, Pa., U1; Reading, Pa., C2; Titusville, Pa., U2; Washington, Pa., J2; McKeesport, Pa., U1; F1; Bridgeville, Pa., U2; Dunkirk, N. Y., A3; Massillon, O., R3; Chicago, U1; Syracuse, N. Y., C11; Watervliet, N. Y., A3; Waukegan, A5; Canton, O., T3; Ft. Wayne, J4; Philadelphia, D3; Detroit, R3.

Wire: Waukegan, A5; Massillon, O., R3; McKeesport, Pa., F1; Ft. Wayne, J4; Harrison, N. J., D3; Baltimore, A7; Dunkirk, A3; Monessen, P1; Syracuse, C11; Bridgeville, U2.

Structural: Baltimore, A7; Massillon, O., R3; Chicago, Ill., J4; Watervliet, N. Y., A3; Syracuse, C11.

Plates: Brackenridge, Pa., A3; Chicago, U1; Munhall, Pa., U1; Midland, Pa., C11; New Castle, Ind., J2; Middletown, A7; Washington, Pa., J2; Cleveland, Massillon, R3; Coatesville, Pa., C15; Philadelphia, D5.

Forged discs, die blocks, rings: Pittsburgh, C11; Syracuse, C11; Ferndale, Mich., A3; Washington, Pa., J2.

Forgings billets: Midland, Pa., C11; Baltimore, A7; Washington, Pa., J2; McKeesport, F1; Massillon, Canton, O., R3; Watervliet, A3; Pittsburgh, Chicago, U1; Syracuse, C11; Detroit, R3.

## Some Indications Of Leveling

**Market active at current level . . . Mill buying still heavy enough to hold prices . . . Some weakness in secondary grades . . . Cast stronger for openhearth use.**

♦ **SCRAP CONSUMERS** managed to keep prices under control this week—but just barely.

Something of an uneasy truce prevailed in the market as prices in major consuming areas held firm, but unchanged, with exception of Cleveland and Buffalo. Secondary grades dropped in Chicago, but despite best efforts of the mills, dealers refused to move No. 1 scrap at lower prices.

Some sources seem to feel that the market has reached a leveling-off stage. But this could be only a temporary period of uncertainty. There's no doubt the market has lost some of its steam, but some mills admit they are resting on their inventories and gambling for an easier tone later in the year.

With steel production continuing at a high level, blast furnace output is critical in the present situation. And there are signs that some blast furnaces are about due to be taken out of production. If so, the mills affected will have to fall back on scrap and this could give the market another shot in the arm.

Meanwhile, THE IRON AGE scrap composite held steady at the new record price of \$55.50 established last week.

**Pittsburgh . . .** Market here remains strong and steady. There has been no new mill activity, and talk is that prices are over the crest. Attempts by brokers to buy at reduced figures still find dealers uninterested. New buys by a major area consumer are expected this week. There are reports that brokers are having difficulty moving railroad specialties at prices paid on latest lists. Blast furnace grades are strong, but there have been no new mill purchases to establish higher prices.

**Chicago . . .** In an unsettled market, No. 2 grades indicated a very mild weakness, chiefly as brokers waited expected purchases by large mills later on this week. A wave of buying by smaller mills in the area failed to indicate the weakness forecast by many sources earlier, and a number of grades, particularly railroad, continued strong. Mills confirmed purchases during the week of No. 1 heavy at \$55 and No. 1 RR at \$59.

**Philadelphia . . .** Indications are that the market here may be leveling off. Dealers are keeping moving scrap to mills which continue to buy at current prices. Trading is firm. A major consumer is reported to be sweetening openhearths with cast because of a shortage of pig iron. This tended to strengthen these grades. Several railroad grades are up \$1.

**New York . . .** Steelmaking and blast furnace grades continue to move briskly here at previous price levels. Some segments of the trade anticipate a dip in No. 2 prices, but others are sure that future mill orders will include larger tonnages of these grades at least at going prices. Cast grades are up on the basis of new orders from a large steel mill in an adjacent consuming district.

**Detroit . . .** No new buying has been reported, but there is still an undercurrent of strength in the market. Prices of the new auto lists which close this week are expected to stay the same with the possibility that they might be \$1 lower. Further cutbacks in auto production and the resulting decrease in the amount of scrap generated are the main reasons the market remains strong.

**Cleveland . . .** Price of No. 1 heavy melting advanced another \$1 on purchase by a local mill at \$59 and Valley low phos price went up \$2 on sale of electric furnace material at \$63 to two

mills on fringes of district. Some smaller sales at even higher prices were also reported and brokers were paying high to cover old orders. Some blast furnace material was also sold in Cleveland for \$37. Despite continuing price advance and generally firm markets, there were few major new orders around. Production material is still scarce.

**Birmingham . . .** Some brokers who have been buying openhearth scrap to cover old orders at a loss of from \$2 to as much as \$4 per ton, have stopped buying, saying they have reason to believe the market is getting a little easier. Others, however, are still taking the losses to fill contracts. Considerable scrap is still being moved by barge to Northern mills, and many dealers say they are making a greater profit than they could selling to Southern mills.

**St. Louis . . .** Recent scrap price advances stimulated movement to this district. Receipts are about equal to the melt, and with good weather prevailing flow is expected to increase. Market still strong.

**Cincinnati . . .** One local mill came into market for a modest tonnage of primary and secondary steel and No. 2 bundles at quoted levels, but overall the market was marking time. Slowness of Pittsburgh market has put damper on river shipments.

**Buffalo . . .** Openhearth and railroad grades rose from \$3 to \$5 on the basis of market appraisal and activity in neighboring districts. Dealer inventories are low, with most yards emptied by current high prices.

**Boston . . .** The market continues firm and fairly active. Just about everyone seems to be in the market, in varying degrees. Few secondary steelmaking grades showed additional strength, but generally the prices held. Export situation is a little stronger, but with permits still needed for everything leaving the country, any change will be minor. An unusual feature in the last several weeks has been the increased demand for unstripped motor blocks, which has served to push the price higher.

**West Coast . . .** Exporting continues to step up in Los Angeles, San Francisco, and Seattle. Although mills have nice big inventories, they admit they're not getting all they want.

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April 26, 1956

# Scrap Prices (Effective April 24, 1956)

## Pittsburgh

No. 1 hvy. melting	\$56.00 to \$57.00
No. 2 hvy. melting	48.00 to 49.00
No. 1 bundles	56.00 to 57.00
No. 2 bundles	46.00 to 47.00
Machine shop turn.	37.00 to 38.00
Mixed bor. and turn.	37.00 to 38.00
Shoveling turnings	41.00 to 42.00
Cast iron borings	41.00 to 42.00
Low phos. punch'g's plate	64.00 to 65.00
Heavy turnings	52.00 to 53.00
No. 1 RR hvy. melting	64.00 to 65.00
Scrap rails, random lgth.	65.00 to 66.00
Rails 2 ft and under	73.00 to 74.00
RR. steel wheels	70.00 to 71.00
RR. spring steel	70.00 to 71.00
RR. couplers and knuckles	70.00 to 71.00
No. 1 machinery cast	58.00 to 59.00
Cupola cast	52.00 to 53.00
Heavy breakable cast	50.00 to 51.00

## Chicago

No. 1 hvy. melting	\$54.00 to \$55.00
No. 2 hvy. melting	44.00 to 45.00
No. 1 factory bundles	59.00 to 60.00
No. 1 dealers' bundles	54.00 to 55.00
No. 2 dealers' bundles	40.00 to 41.00
Machine shop turn.	31.00 to 32.00
Mixed bor. and turn.	33.00 to 34.00
Shoveling turnings	33.00 to 34.00
Cast iron borings	33.00 to 34.00
Low phos. forge crops	63.00 to 64.00
Low phos. punch'g's plate	59.00 to 60.00
Low phos. 3 ft and under	58.00 to 59.00
No. 1 RR. hvy. melting	58.00 to 60.00
Scrap rails, random lgth.	67.00 to 68.00
Rolling rails	74.00 to 75.00
Rails 2 ft and under	73.00 to 75.00
Locomotive tires, cut	64.00 to 65.00
Cut bolsters & side frames	64.00 to 65.00
Angles and splice bars	70.00 to 71.00
RR. steel car axles	71.00 to 72.00
RR. couplers and knuckles	63.00 to 64.00
No. 1 machinery cast	57.00 to 58.00
Cupola cast	53.00 to 54.00
Heavy breakable cast	45.00 to 46.00
Cast iron brake shoes	44.00 to 45.00
Cast iron car wheels	55.00 to 56.00
Malleable	65.00 to 66.00
Stove plate	46.00 to 47.00
Steel car wheels	63.00 to 64.00

## Philadelphia Area

No. 1 hvy. melting	\$55.00 to \$56.00
No. 2 hvy. melting	46.00 to 47.00
No. 1 bundles	55.00 to 56.00
No. 2 bundles	44.00 to 45.00
Machine shop turn.	37.00 to 38.00
Mixed bor. short turn.	38.00 to 39.00
Cast iron borings	41.00 to 42.00
Shoveling turnings	41.00 to 42.00
Clean cast chem. borings	46.50 to 47.50
Low phos. 5 ft and under	58.00 to 59.00
Low phos. 2 ft and under	59.00 to 60.00
Low phos. punch'g's	59.00 to 60.00
Elec. furnace bundles	56.00 to 57.00
Heavy turnings	51.00 to 52.00
RR. steel wheels	62.00 to 63.00
RR. spring steel	62.00 to 63.00
Rails 18 in. and under	67.00 to 68.00
Cupola cast	50.00 to 52.00
Heavy breakable cast	53.00 to 54.00
Cast iron car wheels	57.00 to 58.00
Malleable	69.00 to 70.00
Unstripped motor blocks	38.00 to 39.00
No. 1 machinery cast	55.00 to 56.00

## Cleveland

No. 1 hvy. melting	\$53.00 to \$59.00
No. 2 hvy. melting	50.00 to 51.00
No. 1 bundles	58.00 to 59.00
No. 2 bundles	48.00 to 49.00
No. 1 busheling	58.00 to 59.00
Machine shop turn.	32.00 to 33.00
Mixed bor. and turn.	36.00 to 37.00
Shoveling turnings	36.00 to 37.00
Cast iron borings	36.00 to 37.00
Cut struct'l & plates, 2 ft & under	62.00 to 63.00
Drop forge flashings	58.00 to 59.00
Low phos. punch'g's plate	59.00 to 60.00
Foundry steel, 2 ft & under	60.00 to 61.00
No. 1 RR. heavy melting	60.00 to 61.00
Rails 2 ft and under	73.00 to 74.00
Rails 18 in. and under	74.00 to 75.00
Railroad grate bars	43.00 to 44.00
Steel axle turnings	40.00 to 41.00
Railroad cast	59.00 to 60.00
No. 1 machinery cast	58.00 to 59.00
Stove plate	54.00 to 55.00
Malleable	61.00 to 62.00

## Iron and Steel Scrap

Going prices of iron and steel scrap as obtained in the trade by THE IRON AGE based on representative tonnages. All prices are per gross ton delivered to consumer unless otherwise noted.

## Youngstown

No. 1 hvy. melting	\$60.00 to \$61.00
No. 2 hvy. melting	46.00 to 47.00
No. 1 bundles	60.00 to 61.00
No. 2 bundles	43.00 to 44.00
Machine shop turn.	32.00 to 33.00
Shoveling turnings	37.00 to 38.00
Cast iron borings	37.00 to 38.00
Low phos. plate	62.00 to 63.00

## Buffalo

No. 1 hvy. melting	\$54.00 to \$55.00
No. 2 hvy. melting	42.00 to 43.00
No. 1 busheling	54.00 to 55.00
No. 1 bundles	54.00 to 55.00
No. 2 bundles	38.00 to 39.00
Machine shop turn.	29.00 to 30.00
Mixed bor. and turn.	30.00 to 31.00
Shoveling turnings	31.00 to 32.00
Cast iron borings	31.00 to 32.00
Low phos. plate	57.00 to 58.00
Scrap rails, random lgth.	60.00 to 61.00
Rails 2 ft and under	70.00 to 71.00
RR. steel wheels	60.00 to 61.00
RR. spring steel	60.00 to 61.00
RR. couplers and knuckles	60.00 to 61.00
No. 1 machinery cast	53.00 to 54.00
No. 1 cupola cast	50.00 to 51.00

## Detroit

Brokers buying prices per gross ton, on cars:	
No. 1 hvy. melting	\$53.00 to \$54.00
No. 2 hvy. melting	46.00 to 47.00
No. 1 bundles, openhearth	53.00 to 54.00
No. 2 bundles	38.00 to 39.00
New busheling	53.00 to 54.00
Drop forge flashings	52.50 to 53.50
Machine shop turn.	24.00 to 25.00
Mixed bor. and turn.	27.00 to 28.00
Shoveling turnings	27.00 to 28.00
Cast iron borings	27.00 to 28.00
Low phos. punch'g's, plate	53.00 to 54.00
No. 1 cupola cast	46.00 to 47.00
Heavy breakable cast	39.00 to 40.00
Stove plate	40.00 to 41.00
Automotive cast	50.00 to 51.00

## St. Louis

No. 1 hvy. melting	\$45.00 to \$46.00
No. 2 hvy. melting	42.50 to 43.50
No. 1 bundles	47.00 to 48.00
No. 2 bundles	38.50 to 39.50
Machine shop turn.	29.50 to 30.50
Cast iron borings	31.50 to 32.50
Shoveling turnings	31.50 to 32.50
No. 1 RR. hvy. melting	57.00 to 58.00
Rails, random lengths	60.00 to 61.00
Rails 18 in. and under	67.00 to 68.00
Locomotive tires uncut	57.00 to 58.00
Angles and splice bars	58.00 to 59.00
Std. steel car axles	55.00 to 56.00
RR. specialties	58.00 to 59.00
Cupola cast	51.00 to 52.00
Heavy breakable cast	43.00 to 44.00
Cast iron brake shoes	42.00 to 43.00
Stove plate	42.00 to 43.00
Cast iron car wheels	57.00 to 58.00
Rolling rails	73.00 to 74.00
Malleable	50.00 to 51.00
Unstripped motor blocks	43.00 to 44.00

## Boston

Brokers buying prices per gross ton, on cars:	
No. 1 hvy. melting	\$47.00 to \$48.00
No. 2 hvy. melting	37.00 to 37.50
No. 1 bundles	47.00 to 48.00
No. 2 bundles	35.50 to 36.00
No. 1 busheling	47.00 to 48.00
Elec. furnace, 3 ft & under	47.50 to 48.50
Machine shop turn.	28.00 to 28.50
Mixed bor. and short turn.	28.00 to 29.00
Shoveling turnings	31.00 to 31.50
Clean cast chem. borings	32.00 to 33.00
No. 1 machinery cast	45.50 to 46.00
Mixed cupola cast	41.00 to 42.00
Heavy breakable cast	42.50 to 43.00
Stove plate	39.00 to 40.00
Unstripped motor blocks	27.50 to 28.00

## New York

Brokers buying prices per gross ton, on cars:	
No. 1 hvy. melting	\$50.00 to \$51.00
No. 2 hvy. melting	42.00 to 43.00
No. 2 bundles	40.00 to 41.00
Machine shop turn.	27.00 to 28.00
Mixed bor. and turn.	27.00 to 28.00
Shoveling turnings	31.00 to 32.00
Clean cast chem. borings	32.00 to 33.00
No. 1 machinery cast	49.00 to 50.00
Mixed yard cast	46.00 to 47.00
Charging box cast	46.00 to 47.00
Heavy breakable cast	46.00 to 47.00
Unstripped motor blocks	33.00 to 34.00

## Birmingham

No. 1 hvy. melting	\$39.00 to \$40.00
No. 2 hvy. melting	37.00 to 38.00
No. 1 bundles	39.00 to 40.00
No. 2 bundles	32.00 to 33.00
No. 1 busheling	39.00 to 40.00
Machine shop turn.	21.00 to 22.00
Shoveling turnings	22.00 to 23.00
Cast iron borings	21.50 to 22.50
Electric furnace bundles	44.00 to 45.00
Bar crops and plates	52.00 to 53.00
Structural and plate, 2 ft	51.00 to 52.00
No. 1 RR. hvy. melting	49.00 to 50.00
Scrap rails, random lgth.	58.00 to 59.00
Rails, 18 in. and under	61.00 to 62.00
Angles & splice bars	58.00 to 59.00
Rolling rails	63.00 to 64.00
No. 1 cupola cast	47.50 to 48.50
Stove plate	46.00 to 47.00
Charging box cast	32.00 to 33.00
Cast iron car wheels	39.00 to 40.00
Unstripped motor blocks	37.00 to 38.00
Mashed tin cans	15.00 to 16.00

## Cincinnati

Brokers buying prices per gross ton, on cars:	
No. 1 hvy. melting	\$53.00 to \$54.00
No. 2 hvy. melting	43.00 to 44.00
No. 1 bundles	53.00 to 54.00
No. 2 bundles	40.00 to 41.00
Machine shop turn.	34.00 to 35.00
Mixed bor. and turn.	34.00 to 35.00
Shoveling turnings	36.00 to 37.00
Cast iron borings	34.00 to 35.00
Low phos. 18 in. & under	59.00 to 60.00
Rails, random lengths	63.00 to 64.00
Rails, 18 in. and under	71.00 to 72.00
No. 1 cupola cast	60.00 to 61.00
Hvy. breakable cast	48.00 to 49.00
Drop broken cast	59.00 to 60.00

## San Francisco

No. 1 hvy. melting	\$36.00
No. 2 hvy. melting	30.00
No. 1 bundles	35.00
No. 2 bundles	26.00
No. 3 bundles	20.00
Machine shop turn.	18.00
Cast iron borings	20.00
No. 1 RR. hvy. melting	45.00
No. 1 cupola cast	43.00

## Los Angeles

No. 1 hvy. melting	\$38.00
No. 2 hvy. melting	32.00
No. 1 bundles	37.00
No. 2 bundles	28.00
No. 3 bundles	22.00
Machine shop turn.	18.00
Shoveling turnings	21.00
Cast iron borings	18.00
Elec. furn. 1 ft and under	38.00
No. 1 RR. hvy. melting	38.00
No. 1 cupola cast	46.00

## Seattle

No. 1 hvy. melting	\$39.00
No. 2 hvy. melting	35.00
No. 2 bundles	26.00
No. 3 bundles	20.00
No. 1 cupola cast	45.00
Mixed yard cast	45.00

## Hamilton, Ont.

No. 1 hvy. melting	\$50.50
No. 2 hvy. melting	46.50
No. 1 bundles	50.50
No. 2 bundles	42.00
Mixed steel scrap	44.50
Bushings	40.50
Bush., new fact., prep'd	44.50
Bush., new fact., unprep'd	44.50
Machine shop turn.	33.00
Short steel turn.	27.50
Mixed bor. and turn.	24.00
Rails, rerolling	58.50
Cast scrap	50.00



In London, 145 years ago, William Newberry patented the first endless band saw. But to Perine, in Paris, is due credit for improvements, devised some forty years later, which made general use of the band saw possible. These improvements consisted mainly in securing a satisfactory joint, and steel of sufficient pliability.

Now, endless demands on steel—for muscle-savers, time-savers, and cost-savers—are being made by industry, agriculture, transportation, construction and the military. To meet these requirements, an endless supply of scrap must be maintained.

***For the purchase or sale of iron or steel scrap...***

***phone or write "Your Chicago Broker"***



***231 S. La Salle St., Chicago***

***Telephone ANdover 3-3900***

# Copper Horizons Brighter

**Oversupply of prompt copper drops London Metal Exchange price . . . Currently in line with U. S. producers . . . It could mean one world copper price a little nearer.**

♦ ROME WASN'T built in a day. And neither will a "one world" copper price be arrived at overnight. But recent action on the London Metals Exchange is encouraging.

Due primarily to an oversupply, copper price on the LME dropped at one point to almost a full cent under price for U. S. producers copper. It is currently leveling off at just about 46¢ per lb, exactly what fabricators have to pay for domestic metal.

If this situation continues, U. S. manufacturers will be paying a price within a fraction of a cent per lb for all producers copper, no matter the source.

One good reason to believe that relative stability is possible is the cause of the sharp LME drop: oversupply.

At the present time LME receives for trading about 2/3 of all copper exported from Chile. This is a Chilean policy and up to now LME traders have been in accord. However, the latest drop, because of prompt copper oversupply, has started them wondering if this policy has outlived its usefulness. And another price nosedive could start agitation for its termination and a slightly smaller share of Chilean copper. The U. S. subsidiaries in Chile have been pushing for more shipments to U. S., so Chile could find herself on the other end of the stick for a change.

Actually, this wouldn't hurt Chile because as things stand now she can get just as much in the U. S. as London—and Chile values the dollar more than the pound sterling. She might even decide a change in ratio of shipments is to her advantage, without diplomatic maneuvering.

However, while things are currently looking good, the situation is far from solved. There are still a number of hurdles to be cleared, not the least of which is the negotiations between labor and U. S. producers for new contracts, set to begin in another month or so.

**ALUMINUM . . .** According to Donald M. White, secretary of the Aluminum Assn., building materials, consumer durable goods and transportation equipment accounted for almost half of all wrought aluminum shipped by members of the association during the last six months of 1955. Total was 49.3 pct, up .2 pct over the first half of the year.

Building materials registered a 1-point increase, transportation nine-tenths of a point. Consumer durable goods dropped over 1.5 pct.

On a total volume basis, Mr. White pointed out that in 1955 last half shipments exceeded first half by 5.2 pct. The group considered the transportation rise particularly significant since it indicated increased use of aluminum by the automotive industry.

Reynolds Metals has introduced Tubed Sheet One-Side-Flat, as a com-

panion product to its tubed sheet line. The new development differs from its older brother in that when the tube is expanded from the sheet one side remains flat. According to company reports aircraft manufacturers are making detailed studies of the new product for possible use in aircraft where heat caused by air friction is a factor. The study will determine feasibility of passing a refrigerant through aircraft skins made of the tubed sheet.

**NICKEL . . .** In an address aimed at shareholders, but of particular interest to nickel consuming industries, John F. Thompson, chairman of International Nickel Co. of Canada, Ltd., this week indicated that they expected more nickel to be available to industry in 1956 than 1955, and that 1957 would see an equally substantial increase.

Mr. Thompson gave as his basic reasoning the fact that free world production would probably increase and purchasing for the U. S. stockpile would be moderated.

While Mr. Thompson presented no concrete figures for the first quarter 1956 operations, he did indicate that he expected International Nickel earnings to exceed those for the comparable period in 1955. First quarter 1955 was record high for any first quarter.

On prices, Mr. Thompson said his company would not be dominated by short-term considerations to the detriment of long-term planning by nickel consumers. He recognized that in many of its applications nickel is highly competitive with other materials and insisted that Inco would be conservative in following rising trends. This may mean no, or only slight, increase in near future.

**SILVER . . .** Output of refined silver in last calculated month, February, was up over both the previous month and the corresponding period in 1955. Refiners turned out 7.648 million oz, 240,000 oz more than January and 2.044 million oz more than February 1955. Imports followed the same pattern with export dropping to the lowest point in over a year.

Domestic mine output for the same period also registered an increase over the comparable period in 1955 and over the previous month. The 3,028,070 oz mined exceeded January production by 6 pct and was up over 1955 by 27,900 oz.

This is significant since January output was down from December 1955 and from corresponding period 1955.

## Daily Nonferrous Metal Prices

(Cents per lb except as noted)

	Apr. 18	Apr. 19	Apr. 20	Apr. 21	Apr. 23	Apr. 24
Copper, electro, Conn.	46.00	46.00	46.00	....	46.00	46.00
Copper, Lake, delivered	46.00	46.00	46.00	....	46.00	46.00
Tin, Straits, New York	98.75	98.875	98.75	....	98.875	98.875*
Zinc, East St. Louis	13.50	13.50	13.50	13.50	13.50	13.50
Lead, St. Louis	15.80	15.80	15.80	15.80	15.80	15.80

Note: Quotations are going prices.

\* Tentative



## MORE CASTING VALUE PER DOLLAR

Monarch pioneered mechanized methods assure casting volume that will meet your highest requirements. Cost savings can be obtained from the first castings produced. Monarch's staff of skilled technicians are trained in every phase of metal-working production to achieve these results.

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MANUFACTURERS OF Aluminum Permanent Mold Castings • Zinc Die Castings • Aluminum Die Castings  
Exclusive Velvagre Finishing • Vitreous Enamel Finishing — MEMBERS, CERTIFIED ZINC PLAN • AMERICAN DIE CASTING INSTITUTE

# Nonferrous Prices (Effective April 24, 1956)

## MILL PRODUCTS

(Cents per lb, unless otherwise noted)

### ALUMINUM

(Base 30,000 lb, f.o.b. ship. pt., frt. allowed)

Flat Sheet (Mill Finish) and Plate

("P" temper except 6061-0)

Alloy	.032	.081	.136- .249	250- 3
1100, 3003....	42.3	40.2	39.0	38.0
5052.....	49.8	44.9	43.2	41.4
6061-0.....	46.9	42.7	40.9	40.8

### Extruded Solid Shapes

Factor	6063 T-5	6062 T-6
6-8.....	43.1-44.8	58.1-61.7
12-14.....	43.8-45.2	59.0-63.3
24-26.....	46.8-47.2	69.2-73.6
36-38.....	55.1-55.7	92.0-96.8

### Screw Machine Stock—2011-T-3

Size*	3/8	1/2-5/8	3/4-1	1 1/4-1 1/2
Price	56.0	54.9	53.6	51.6

### Roofing Sheet, Corrugated

(Per sheet, 26" wide base, 16,000 lb)

Length* →	72	96	120	144
1019 gage.....	\$1.319	\$1.742	\$2.175	\$2.605
1024 gage.....	1.639	2.177	2.707	3.247

## MAGNESIUM

(f.o.b. shipping pt., carload frt. allowed)  
Sheet and Plate

Type →	Gage →	.250- 3.00	.250- 2.00	.188	.081	.032
FS1 Stand. Grade			65.6	66.5	75	100
FS1 Spec.			88.9	91.1	103.5	163.1
Tread Plate			67.8	68.9		
Tooling Plate		70.2				

### Extruded Shapes

factor →	6-8	12-14	24-26	36-38
Comm. Grade (FS)	66.4- 69.0	67.5- 69.6	72.1- 72.7	84.9- 85.8
Spec. Grade (AZ31B)	81.4- 84.0	82.5- 84.6	87.1- 87.7	99.9- 100.8

### Alloy Ingot

AZ91B (Die Casting)..... 35 (delivered)  
AZ63A, AZ62A, AZ91C (Sand Casting) 39.25 (Velasco, Tex.)

## NICKEL, MONEL, INCONEL

(Base prices, f.o.b. mill)

"A" Nickel Monel Inconel

	Nickel	Monel	Inconel
Sheet, CR.....	102	83	99
Strip, CR.....	102	92	125
Rod, Bar, HR.....	87	74	93
Angles, HR.....	87	74	93
Plate, HR.....	97	87	95
Seamless tube. 122		110	163
Shot, Blocks.....		71	

## COPPER, BRASS, BRONZE

(Freight included on 500 lbs)

	Sheet	Wire	Rod	Tube
Copper	68.63	.....	.....	68.82
Brass, 70/30	56.00	57.14	.....	56.51
Brass, Low	61.35	61.89	61.29	64.16
Brass, R L	63.07	63.61	63.01	65.88
Brass, Naval	59.80	65.06	54.11	62.06
Muntz Metal	57.84	61.85	63.65	.....
Comm. Br.	65.33	65.87	65.27	67.89
Mang. Br.	63.54	66.19	57.64	.....
Phos. Br. 5%	66.79	84.44	87.29	.....

## TITANIUM

(10,000 lb base, f.o.b. mill)

Sheet and strip, commercially pure, \$13.10-  
\$13.60; alloy \$15.25-\$15.75; Plate, HR, com-  
mercially pure, \$10.50-\$11.00; alloy, \$11.50-  
\$12.00. Wire, rolled and/or drawn, commerci-  
ally pure, \$9.50-\$11.50; alloy, \$11.50-\$12.50; Bar, HR  
or forged, commercially pure, \$7.90-\$8.15; alloy,  
\$7.90-\$8.10.

## PRIMARY METAL

(Cents per lb, unless otherwise noted)

Aluminum ingot, 99+%, 10,000 lb. freight allowed	25.90
Aluminum pig	24.00
Antimony, American, Laredo, Tex.	33.50
Beryllium copper, per lb cont'd Be	\$43.00
Beryllium aluminum 5% Be, Dollars per lb contained Be.....	\$74.75
Bismuth, ton lots	\$ 2.25
Cadmium, del'd	\$ 1.70
Cobalt, 97-99% (per lb)	\$2.60 to \$2.67
Copper, electro, Conn. Valley	46.00
Copper, Lake, delivered	46.00
Gold, U. S. Treas., per troy oz.	\$35.00
Indium, 99.9% dollars per troy oz.	\$ 2.25
Iridium, dollars per troy oz.	\$100 to \$120
Lead, St. Louis	15.80
Lead, New York	16.00
Magnesium, 99.8+%, f.o.b. Velasco, Tex., 10,000 lb, pig	33.75
Ingot	34.50
Magnesium, sticks, 100 to 500 lb.	56.00
Mercury, dollars per 76-lb flask, f.o.b. New York	\$268 to \$270
Nickel electro	64.50
Nickel oxide sinter at Copper Cliff, Ont., contained nickel	60.75
Palladium, dollars per troy oz.	\$23 to \$24
Platinum, dollars per troy oz.	\$97 to \$107
Silver, New York, cents per troy oz.	90.75
Tin, New York	98.875*
Titanium sponge, grade A-1	\$ 3.45
Zinc, East St. Louis	13.50
Zinc, New York	14.00
Zirconium sponge	\$10.00

\*Tentative

## REMETLED METALS

### Brass Ingot

(Cents per lb delivered, carloads)

85-5-5-5 ingot	
No. 115	42.00
No. 120	41.00
No. 123	40.00
80-10-10 ingot	
No. 305	45.75
No. 315	44.00
88-10-2 ingot	
No. 210	58.25
No. 215	54.25
No. 245	48.75
Yellow ingot	
No. 405	33.25
Manganese bronze	
No. 421	37.75

### Aluminum Ingot

(Cents per lb del'd 30,000 lb and over)

95-5 aluminum-silicon alloys	
0.30 copper max.	30.50-31.25
0.60 copper max.	30.25-31.00
Piston alloys (No. 122 type)	32.00-33.00
No. 12 alum. (No. 2 grade)	28.75-29.50
108 alloy	28.75-29.25
195 alloy	30.00-31.00
13 alloy (0.60 copper max.)	30.25-31.00
AX8-679	28.75-29.25

## Steel deoxidizing aluminum, notch bar

granulated or shot

Grade 1—95-97 1/2%	28.75-30.00
Grade 2—92-95%	28.00-29.90
Grade 3—90-92%	27.25-28.50
Grade 4—85-90%	26.50-27.50

## SCRAP METALS

### Brass Mill Scrap

(Cents per pound, add 1¢ per lb for  
shipments of 20,000 lb and over)

	Heavy	Turnings
Copper	43 1/2	42 1/2
Yellow brass	32 1/2	29 1/2
Red brass	38 1/2	37 1/2
Comm. bronze	39 1/2	39 1/2
Mang. bronze	27 1/2	29 1/2
Yellow brass rod ends	32	.....

### Custom Smelters Scrap

(Cents per pound carload lots, delivered  
to refinery)

No. 1 copper wire	10 1/2
No. 2 copper wire	39
Light copper	36 1/2
*Refinery brass	37
*Dry copper content.	

### Ingot Makers Scrap

(Cents per pound carload lots, delivered  
to refinery)

No. 1 copper wire	40 1/2
No. 2 copper wire	39 1/2
Light copper	36 1/2
No. 1 composition	33 1/2
No. 1 comp. turnings	32 1/2
Hvy. yellow brass solids	23 1/2
Brass pipe	25
Radiators	24 1/2

### Aluminum

Mixed old cast	19	—20
Mixed new clips	20	—21
Mixed turnings, dry	18 1/2	—19 1/2

### Dealers' Scrap

(Dealers' buying price, f.o.b. New York  
in cents per pound)

### Copper and Brass

No. 1 heavy copper and wire	37 1/2	—38
No. 2 heavy copper and wire	35 1/2	—36
Light copper	33	—33 1/2
New type shell cuttings	33	—34 1/2
Auto radiators (unswaged)	22 1/2	—23
No. 1 composition	31	—31 1/2
No. 1 composition turnings	30	—30 1/2
Unlined red car boxes	22	—22 1/2
Cocks and faucets	23 1/2	—24
Clean heavy yellow brass	20	—20 1/2
Brass pipe	25	—25 1/2
New soft brass clippings	24 1/2	—25
No. 1 brass rod turnings	22	—22 1/2

### Aluminum

Alum. pistons and struts	17	—17 1/2
Aluminum crankcases	16 1/2	—16 3/4
1100 (2S) aluminum clippings	18	—18 1/2
Old sheet and utensils	17 1/2	—17 3/4
Borings and turnings	10 1/2	—11
Industrial castings	16	—16 1/2
2024 (24S) clippings	17 1/2	—18

### Zinc

New zinc clippings	8 1/2	—9
Old zinc	6	—6 1/2
Zinc routings	4 1/2	—4 3/4
Old die cast scrap	3 1/2	—3 3/4

### Nickel and Monel

Pure nickel clippings	\$1.75-\$2.00
Clean nickel turnings	\$1.65-\$1.85
Nickel anodes	\$1.75-\$2.00
Nickel rod ends	\$1.75-\$2.00
New Monel clippings	80-90
Clean Monel turnings	65-70
Old sheet Monel	70-80
Nickel silver clippings, mixed	25
Nickel silver turnings, mixed	21

### Lead

Soft scrap lead	12 1/2	—13
Battery plates (dry)	7	—7 1/2
Batteries, acid free	4 1/2	—4 3/4

### Miscellaneous

Block tin	84	—85
No. 1 pewter	66	—67
Auto babbit	43 1/2	—44 1/2
Mixed common babbit	15 1/2	—15 3/4
Solder joints	20	—20 1/2
Siphon tops	50	—50
Small foundry type	16 1/2	—16 3/4
Monotype	15 1/2	—15 3/4
Line and stereotype	14 1/2	—15
Electrotype	13	—13 1/2
Hand picked type shells	10 1/2	—11
Line and stereo. dross	5 1/2	—6
Electro. dross	4 1/2	—5

## IRON AGE

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

**STEEL PRICES**

(Effective April 24, 1956)

	BILLETS, BLOOMS, SLABS			PIL-ING	SHAPES STRUCTURALS			STRIP					
	Carbon Re-rolling Net Ton	Carbon Forging Net Ton	Alloy Net Ton		Carbon	Hi Str. Low Alloy	Carbon Wide-Flange	Hot-rolled	Cold-rolled	Hi Str. H.R. Low Alloy	Hi Str. C.R. Low Alloy	Alloy Hot-rolled	Alloy Cold-rolled
EAST	Bethlehem, Pa.		\$96.00 R1		4.65 B3	6.80 B3	4.65 B3						
	Buffalo, N. Y.	\$68.50 B3	\$84.50 R3 B3	\$96.00 R3 B3	5.45 B3	4.65 B3	6.80 B3	4.65 B3	4.325 R3,B3	6.25 B3 6.25 R7,S10	6.425 B3	9.10 B3	
	Claymont, Del.												
	Harrison, N. J.												13.45 C11
	Conschocken, Pa.								4.375 A7	6.30 A2	6.425 A2		
	New Bedford, Mass.									6.70 R6			
	Jahnstown, Pa.	\$68.50 B3	\$84.50 B3	\$96.00 B3		4.65 B3	6.80 B3						
	Boston, Mass.									6.80 T8			13.80 T8
	New Haven, Conn.									6.70 D1 A5			
	Phoenixville, Pa.				5.15 P2		5.15 P2						
	Sparrows Pt., Md.								4.325 B3	6.25 B3	6.425 B3	9.10 B3	
	Bridgeport, Wallingford, Conn.	\$73.50 N8	\$89.50 N8						4.625 N8	6.70 W1		7.50 N8	
	Pawtucket, R. I. Worcester, Mass.									6.80 N7 A5			13.80 N7 A5
MIDDLE WEST	Alton, Ill.								4.50 L1				
	Ashland, Ky.								4.325 A7				
	Canton-Massillon, Dover, Ohio		\$86.50 R3	\$96.00 R3									13.45 G4
	Chicago, Ill.	\$68.50 U1	\$84.50 R3, U1,W8	\$96.00 R3, U1,W8	5.45 U1	4.60 U1, W8	6.75 U1, Y1	4.60 U1	4.55 A1 4.325 N4,W8	6.35 A1,T8		7.20 W8	13.45 T8
	Cleveland, Ohio									6.25 A5 J3	9.30 A5		13.45 A5
	Detroit, Mich.			\$96.00 R5					4.425 G3,M2	6.35 D1,D2, G3 M2,P11	6.525 G3	9.20 D2, G3	
	Duluth, Minn.												
	Gary, Ind Harbor, Indiana	\$68.50 U1	\$84.50 U1	\$96.00 U1, Y1	5.45 I3	4.60 U1, I3	6.75 U1, I3		4.325 I3, U1,Y1	6.35 I3 6.25 Y1	6.425 I3 U1,Y1	9.30 Y1	7.20 Y1, U1
	Sterling, Ill.								4.425 N4				
	Indianapolis, Ind.									6.40 C5			
	Newport, Ky.											7.20 N5	
	Middletown, Ohio									6.45 A7			
	Niles, Warren, Ohio Sharon, Pa.	\$68.50 C10	\$84.50 C10	\$96.00 C10					4.325 S1, R3	6.25 S1, R3,T4	6.425 S1, R3	9.10 S1, R3	7.20 S1 13.45 S1
WEST	Pittsburgh, Pa. Midland, Pa. Butler, Pa.	68.50 U1, J3	\$84.50 J3, U1,C11	\$96.00 U1, C11	5.45 U1	4.60 U1, J3	6.75 U1, J3	4.60 U1	4.325 P6	6.25 S7,B4		7.20 S9	13.45 S9
	Portsmouth, Ohio												
	Weirton, Wheeling, Follansbee, W. Va.					4.60 W3			4.325 W3	6.25 F3,W3	6.425 W3	9.10 W3	
	Youngstown, Ohio		\$84.50 C10	\$96.00 Y1, C10			6.75 Y1		4.325 U1, Y1	6.25 Y1,C5	6.425 U1, Y1	9.30 Y1	7.20 U1, Y1 13.45 C5
	Fontana, Cal.	78.00 K1	94.00 K1	117.00 K1		5.30 K1	7.40 K1	5.45 K1	5.125 K1	8.00 K1	7.575 K1		8.95 K1
	Geneva, Utah		\$84.50 C7			4.60 C7	6.75 C7						
	Kansas City, Mo.					4.70 S2	6.85 S2				6.675 S2	7.45 S2	
	Los Angeles, Torrance, Cal.		\$94.00 B2	\$116.00 B2		5.30 C7, B2	7.45 B2		5.875 C7, B2	8.30 C1		8.40 B2	
	Minneapolis, Colo.					4.90 C6			5.425 C5				
	Portland, Ore.					5.35 O2							
	San Francisco, Niles, Pittsburg, Cal.		\$94.00 B2			5.25 B2, P9	7.40 B2		5.875 B2, C7				
	Seattle, Wash.		\$98.00 B2			5.35 B2	7.50 B2		5.325 B2				
SOUTH	Atlanta, Ga.								4.525 A8				
	Fairfield, Ala. City, Birmingham, Ala.	\$68.50 T2	\$84.50 T2			5.10 C16 4.60 R3,T2	6.75 T2		4.325 R3 T2 4.825 C10		6.425 T2		
	Houston, Lone Star, Texas	\$74.50 L3	\$89.50 S2	\$101.00 S2		4.70 S2	6.85 S2			6.675 S2		7.45 S2	

## IRON AGE

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

**STEEL  
PRICES**(Effective  
April 24, 1936)

	SHEETS										WIRE ROD	TINPLATE†		BLACK PLATE
	Hot-rolled 18 ga. & hvyr.	Cold- rolled	Galvanized 10 ga.	Enamel- ing 12 ga.	Long Tens 10 ga.	Hi Str. Low Alloy H.R.	Hi Str. Low Alloy C.R.	Hi Str. Low Alloy Galv.	Hot- rolled 19 ga.			Cokes* 1.25-lb. base box	Electro* 0.25-lb. base box	Holloware Enameling 29 ga.
EAST	Bethlehem, Pa.													
	Buffalo, N. Y.	4.325 B3	5.325 B3			6.375 B3	7.875 B3			5.375 W6		† Special coated mil- terne deduct 50¢ from 1.25-lb. coke base box price. Can-making quality blackplate 55 to 128 lb. deduct \$2.20 from 1.25-lb. coke base box. * COKES: 1.50-lb. add 25¢. ELECTRO: 0.50-lb. add 25¢; 0.75-lb. add 65¢; 1.00-lb. add \$1.00. Differ- ential 1.00 lb./0.25 lb. add 65¢.		
	Claymont, Del.													
	Coatesville, Pa.													
	Conschocken, Pa.	4.375 A2	5.375 A2			6.425 A2								
	Harrisburg, Pa.													
	Hartford, Conn.													
	Johnstown, Pa.									5.375 B3				
	Fairless, Pa.	4.375 U/I	5.375 U/I			6.425 U/I	7.925 U/I					\$9.30 U/I	\$8.00 U/I	
	New Haven, Conn.													
	Phoenixville, Pa.													
	Sparrows Pt., Md.	4.325 B3	5.325 B3	5.85 B3		6.375 B3	7.875 B3	8.60 B3		5.475 B3		\$9.30 B3	\$8.00 B3	
MIDDLE WEST	Worcester, Mass.									5.675 A5				
	Trenton, N. J.													
	Alton, Ill.									5.55 L1				
	Ashland, Ky.	4.325 A7		5.85 A7	5.90 A7									
	Canton-Massillon, Dover, Ohio			5.85 R1, R1										
	Chicago, Joliet, Ill.	4.55 A1 4.325 W4				6.375 U1				5.375 N4 5.375 A5, R3				
	Sterling, Ill.									5.475 N4				
	Cleveland, Ohio	4.325 J3, R3	5.325 J3, R3		5.90 R3	6.375 J3, R3	7.875 J3, R3			5.375 A5				
	Detroit, Mich.	4.425 G3, M2	5.425 G3 5.325 M2			6.475 G3	7.975 G3							
	Newport, Ky.	4.325 N5	5.325 N5	5.85 N5										
	Gary, Ind. Harbor, Indiana	4.325 J3, U1, Y1	5.325 J3, U1, Y1	5.85 U1, I3	5.90 U1, I3	6.25 U1	6.375 Y1, U1, I3	7.875 U1, Y1		5.375 Y1		\$9.20 J3, U1, Y1	\$7.90 J3, U1, Y1	6.45 U1, Y1
	Granite City, Ill.	4.525 G2	5.525 G2	6.05 G2	6.10 G2								\$8.00 G2	6.75 G2
	Kokomo, Ind.			5.95 C9						5.475 C9				
	Mansfield, Ohio	4.325 E2	5.325 E2			6.25 E2								
	Middletown, Ohio		5.325 A7	5.85 A7	5.90 A7	6.25 A7								
	Niles, Warren, Ohio Sharon, Pa.	4.325 S1, R3, N3	5.325 R3, N3	5.85 R3 6.85 N3	5.90 N3	6.25 N3	6.375 S1, R3	7.875 R3				\$9.20 R3	\$7.90 R3	
	Pittsburgh, Pa. Midland, Pa. Butler, Pa.	4.325 J3, U1, P6	5.325 J3, U1, P6	5.85 U1	5.90 U1, A7		6.375 J3, U1	7.875 U1	8.60 U1	5.025 P6 5.375 A5		\$9.20 J3, U1	\$7.90 J3, U1	6.45 U1
	Portsmouth, Ohio	4.325 P7	5.325 P7							5.375 P7				
WEST	Weirton, Wheeling, Falls, W. Va.	4.325 W3, W5	5.325 W3, W5, F3	5.85 W3, W5		6.25 W3, W5	6.375 W3	7.875 W3				\$9.20 W3, W5	\$7.90 W3, W5	6.45 F3, W5
	Youngstown, Ohio	4.325 U1, Y1	5.325 Y1		5.90 Y1		6.375 U1, Y1	7.875 Y1		5.375 Y1				
	Fontana, Cal.	5.125 K1	6.525 K1			7.175 K1	9.075 K1							
	Geneva, Utah	4.425 C7												
	Kansas City, Mo.									5.625 S2				
	Los Angeles, Torrance, Cal.									6.175 B2				
	Minnequa, Colo.									5.625 C6				
	San Francisco, Niles, Pittsburg, Cal.	5.025 C7	6.275 C7	6.60 C7						5.675 C7		\$9.95 C7	\$8.65 C7	
	Seattle, Wash.													
	Atlanta, Ga.													
SOUTH	Fairfield, Ala. Alabama City, Ala.	4.325 R3, T2	5.325 T2	5.85 R3, T2		6.375 T2				5.625 R3	5.025 R3 5.375 T2	\$9.30 T2	\$8.00 T2	
	Houston, Tex.									5.625 S2				

## IRON AGE

**STEEL  
PRICES**(Effective  
April 23, 1956)*Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.*

	BARS						PLATES				WIRE
	Carbon Steel	Reinforcing	Cold Finished	Alloy Hot-rolled	Alloy Cold Drawn	Hi Str. H.R. Low Alloy	Carbon Steel	Flower Plate	Alloy	Hi Str. Low Alloy	
<b>EAST</b>	Bethlehem			5.575 B3	7.425 B3	6.80 B3					
	Buffalo, N. Y.	4.65 B3,R3	4.65 B3,R3	6.30 B5	5.575 B3,R3	7.425 B3,B5	6.80 B3	4.50 B3,R3			6.60 W6
	Claymont, Del.							4.80 C4	6.30 C4	6.725 C4	
	Coatesville, Pa.							4.80 L4	6.30 L4	6.725 L4	
	Conshohocken, Pa.							4.50 A2	5.575 A2	6.725 A2	
	Harrisburg, Pa.						5.10 P2	5.575 C3			
	Hartford, Conn.		6.75 R3		7.725 R3						
	Johnstown, Pa.	4.65 B3	4.65 B3	5.575 B3		6.80 B3	4.50 B3		6.30 B3	6.725 B3	6.60 B3
	Fairless, Pa.	4.80 U1	4.80 U1	5.725 U1							
	Newark, N. J.			6.70 W10		7.60 W10					
	Camden, N. J.			6.70 P10							
	Bridgeport, Putnam, Conn.	4.80 N8		6.80 W10	5.725 N8		4.750 N8				
	Sparrows Pt., Md.		4.65 B3				4.50 B3		6.30 B3	6.725 B3	6.70 B3
	Palmer, Worcester, Readville, Mass.			6.70 W11		7.725 A5 B5	4.50 R3				6.90 A5
	Milton, Pa.	4.80 M7	4.80 M7	6.45 C14	6.70 B5						6.90 W6
	Spring City, Pa.			6.35 K4		7.60 K4					
<b>MIDDLE WEST</b>	Alton, Ill.	4.85 L1									6.775 L1
	Ashland, Newport, Ky.						4.50 A7,N5		6.30 N5		
	Canton-Massillon, Mansfield, Ohio	4.75 R3		6.25 R2,R3	5.575 R3, T5	7.425 R2,R3, T5	4.50 E1				
	Chicago, Joliet, Ill.	4.65 U1, N4,W8,R3, 5.15 P13	4.65 N4,R3, 5.15 P13	6.25 B5,W8, W10,A5,L2	5.575 U1,R3, W8	7.425 A5,W8, W10,L2,B5	4.50 U1,W8, I3,R3 4.725 A1	5.575 U1	6.30 U1	6.725 U1	6.60 A5,R3, N4,W7
	Cleveland, Ohio	4.65 R3	4.65 R3	6.25 A5,C13		7.425 A5,C13	6.80 R3	4.60 J3,R3	5.575 J3	6.725 R3,J3	6.60 A5, C13
	Detroit, Mich.	4.75 G3	4.75 G3	5.90 R5 6.45 B5 6.50 P3 6.10 P8	5.575 R5 5.675 G3	7.425 R5 7.625 B5,P3, P8	6.90 G3	4.60 G3		6.825 G3	
	Duluth, Minn.										6.60 A5
	Gary, Ind. Harbor, Crawfordsville	4.65 I3, U1, Y1	4.65 I3, U1, Y1	6.25 M5,R3	5.575 I3, U1, Y1	7.425 M5	6.80 U1,I3, Y1	4.50 I3, U1, Y1	5.575 I3	6.30 U1,Y1 I3,Y1	6.725 U1, I3,Y1
	Granite City, Ill.							4.70 G2			
	Kokomo, Ind.										6.70 C9
	Sterling, Ill.	4.75 N4	4.75 N4								6.70 N4
	Niles, Warren, Ohio Sharon, Pa.	4.65 R3,C10		6.25 C10	5.75 C10	7.425 C10	6.80 R3	4.50 S1,R3	6.30 S1	6.725 S1	
	Pittsburgh, Pa. Midland, Pa.	4.65 J3, U1, C11	4.65 J3, U1	6.25 A5,C8, C11,J3, W10,B4,R3	5.575 U1,C11	7.425 A5,C11, W10,C8,R3	6.80 J3, U1	4.50 J3, U1	5.575 U1	6.30 U1	6.725 J3, U1
	Portsmouth, Ohio										6.60 A5,J3, P6
	Weirton, Wheeling, Follansbee, W. Va.	4.65 W3						4.50 W3,W5			6.60 P7
	Youngstown, Ohio	4.65 U1,Y1, C10,R3	4.65 U1,Y1, R3	6.25 Y1, U1	5.575 U1,Y1, C10	7.425 Y1,C10, F2	6.80 U1,Y1	4.50 U1,Y1, R3	6.30 Y1	6.725 Y1	6.60 Y1
<b>WEST</b>	Emeryville, Cal.	5.40 J5	5.40 J5								
	Fontana, Cal.	5.35 K1	5.35 K1		6.625 K1		7.50 K1	5.20 K1		7.00 K1	7.375 K1
	Geneva, Utah							4.50 C7		6.725 C7	
	Kansas City, Mo.	4.90 S2	4.90 S2		5.825 S2		7.05 S2				6.85 S2
	Los Angeles, Torrance, Cal.	5.35 B2,C7	5.35 B2,C7	7.70 R3	6.625 B2		7.50 B2			7.825 B2	7.55 B2
	Minneapolis, Colo.	5.10 C6	5.10 C6					5.35 C6			6.85 C6
	Portland, Ore.	5.40 O2	5.40 O2								
	San Francisco, Niles, Pittsburg, Cal.	5.35 C7 5.40 B2,P9	5.35 C7 5.40 B2,P9				7.55 B2				7.55 C7 7.55 C6
	Seattle, Wash.	5.40 B2,P12, N6	5.40 B2,P12				7.55 B2	5.40 B2	7.20 B2	7.625 B2	
<b>SOUTH</b>	Atlanta, Ga.	4.85 A8	4.85 A8								6.80 A8
	Fairfield, Ala. City, Birmingham, Ala.	4.85 T2,R3 5.15 C16	4.85 T2,R3 5.15 C16				6.80 T2	4.50 T2,R3		6.725 T2	6.60 R3, T2
	Houston, Ft. Worth, Lone Star, Tex.	4.90 S2	4.90 S2		5.825 S2		7.05 S2	4.85 L3 4.60 S2	6.40 S2	6.825 S2	6.85 S2

# Steel Prices (Effective April 24, 1956)

## Key to Steel Producers

With Principal Offices

- A1 Acme Steel Co., Chicago  
A2 Alan Wood Steel Co., Conshohocken, Pa.  
A3 Allegheny Ludlum Steel Corp., Pittsburgh  
A4 American Cladmetals Co., Carnegie, Pa.  
A5 American Steel & Wire Div., Cleveland  
A6 Angell Nail & Chaplet Co., Cleveland  
A7 Armco Steel Corp., Middletown, O.  
A8 Atlantic Steel Co., Atlanta, Ga.  
B1 Babcock & Wilcox Tube Div., Beaver Falls, Pa.  
B2 Bethlehem Pacific Coast Steel Corp., San Francisco  
B3 Bethlehem Steel Co., Bethlehem, Pa.  
B4 Blair Strip Steel Co., New Castle, Pa.  
B5 Bliss & Laughlin, Inc., Harvey, Ill.  
B6 Brook Plant, Wickwire Spencer Steel Div., Birdsboro, Pa.  
C1 Calstrip Steel Corp., Los Angeles  
C2 Carpenter Steel Co., Reading, Pa.  
C3 Central Iron & Steel Co., Harrisburg, Pa.  
C4 Claymont Products Dept., Claymont, Del.  
C5 Cold Metal Products Co., Youngstown, O.  
C6 Colorado Fuel & Iron Corp., Denver  
C7 Columbia Geneva Steel Div., San Francisco  
C8 Columbia Steel & Shafting Co., Pittsburgh  
C9 Continental Steel Corp., Kokomo, Ind.  
C10 Copperweld Steel Co., Pittsburgh, Pa.  
C11 Crucible Steel Co. of America, Pittsburgh  
C12 Cumberland Steel Co., Cumberland, Md.  
C13 Cuyahoga Steel & Wire Co., Cleveland  
C14 Compressed Steel Shafting Co., Readville, Mass.  
C15 G. O. Carlson, Inc., Thorndale, Pa.  
C16 Connors Steel Div., Birmingham  
C17 Chester Blast Furnace, Inc., Chester, Pa.  
D1 Detroit Steel Corp., Detroit  
D2 Detroit Tube & Steel Div., Detroit  
D3 Driver Harris Co., Harrison, N. J.  
D4 Dickson Weatherproof Nail Co., Evanston, Ill.  
D5 Henry Distan & Sons, Inc., Philadelphia  
E1 Eastern Stainless Steel Corp., Baltimore  
E2 Empire Steel Co., Mansfield, O.  
F1 Firth Sterling, Inc., McKeesport, Pa.  
F2 Fitzsimmons Steel Corp., Youngstown  
F3 Follansbee Steel Corp., Follansbee, W. Va.  
G1 Globe Iron Co., Jackson, O.

- G2 Granite City Steel Co., Granite City, Ill.  
G3 Great Lakes Steel Corp., Detroit  
G4 Greer Steel Co., Dover, O.  
H1 Hanna Furnace Corp., Detroit  
I1 Ingersoll Steel Div., Chicago  
I2 Inland Steel Co., Chicago  
I4 Interlake Iron Corp., Cleveland  
J1 Jackson Iron & Steel Co., Jackson, O.  
J2 Jessop Steel Corp., Washington, Pa.  
J3 Jones & Laughlin Steel Corp., Pittsburgh  
J4 Joslyn Mfg. & Supply Co., Chicago  
J5 Judson Steel Corp., Emeryville, Calif.  
K1 Kaiser Steel Corp., Fontana, Cal.  
K2 Keystone Steel & Wire Co., Peoria  
K3 Koppers Co., Granite City, Ill.  
K4 Keystone Drawn Steel Co., Spring City, Pa.  
L1 Laclede Steel Co., St. Louis  
L2 La Salle Steel Co., Chicago  
L3 Lone Star Steel Co., Dallas  
L4 Lukens Steel Co., Coatesville, Pa.  
M1 Mahoning Valley Steel Co., Niles, O.  
M2 McLouth Steel Corp., Detroit  
M3 Mercer Tube & Mfg. Co., Sharon, Pa.  
M4 Mid-States Steel & Wire Co., Crawfordsville, Ind.  
M5 Monarch Steel Div., Hammond, Ind.  
M6 Mystic Iron Works, Everett, Mass.  
M7 Milton Steel Products Div., Milton, Pa.  
N1 National Supply Co., Pittsburgh  
N2 National Tube Div., Pittsburgh  
N3 Niles Rolling Mill Div., Niles, O.  
N4 Northwestern Steel & Wire Co., Sterling, Ill.  
N5 Newport Steel Corp., Newport, Ky.  
N6 Northwest Steel Rolling Mills, Seattle  
N7 Newman Crosby Steel Co., Pawtucket, R. I.  
N8 Northeastern Steel Corp., Bridgeport, Conn.  
O1 Oliver Iron & Steel Co., Pittsburgh  
O2 Oregon Steel Mills, Portland  
P1 Page Steel & Wire Div., Monessen, Pa.  
P2 Phoenix Iron & Steel Co., Phoenixville, Pa.  
P3 Pilgrim Drawn Steel Div., Plymouth, Mich.  
P4 Pittsburgh Coke & Chemical Co., Pittsburgh  
P5 Pittsburgh Screw & Bolt Co., Pittsburgh  
P6 Pittsburgh Steel Co., Pittsburgh  
P7 Portsmouth Div., Detroit Steel Corp., Detroit  
P8 Plymouth Steel Co., Detroit

- P9 Pacific States Steel Co., Niles, Cal.  
P10 Precision Drawn Steel Co., Camden, N. J.  
P11 Production Steel Strip Corp., Detroit  
P12 Pacific Steel Rolling Mills, Seattle  
P13 Phoenix Mfg. Co., Juliet, Ill.  
R1 Reeves Steel & Mfg. Co., Dover, O.  
R2 Reliance Div., Eaton Mfg. Co., Massillon, O.  
R3 Republic Steel Corp., Cleveland  
R4 Roehling Sons Co., John A., Trenton, N. J.  
R5 Rotary Electric Steel Co., Detroit  
R6 Rodney Metals, Inc., New Bedford, Mass.  
R7 Rome Strip Steel Co., Rome, N. Y.  
S1 Sharon Steel Corp., Sharon, Pa.  
S2 Sheffield Steel Corp., Kansas City  
S3 Shenango Furnace Co., Pittsburgh  
S4 Simonds Saw and Steel Co., Fitchburg, Mass.  
S5 Sweet's Steel Co., Williamsport, Pa.  
S6 Standard Forging Corp., Chicago  
S7 Stanley Works, New Britain, Conn.  
S8 Superior Drawn Steel Co., Monaca, Pa.  
S9 Superior Steel Corp., Carnegie, Pa.  
S10 Seneca Steel Service, Buffalo  
T1 Tonawanda Iron Div., N. Tonawanda, N. Y.  
T2 Tennessee Coal & Iron Div., Fairfield  
T3 Tennessee Products & Chem. Corp., Nashville  
T4 Thomas Strip Div., Warren, O.  
T5 Timken Steel & Tube Div., Canton, O.  
T6 Tremont Nail Co., Waltham, Mass.  
T7 Texas Steel Co., Fort Worth  
T8 Thompson Wire Co., Boston  
U1 United States Steel Corp., Pittsburgh  
U2 Universal-Cyclops Steel Corp., Bridgeville, Pa.  
U3 Ulbrich Stainless Steels, Wallingford, Conn.  
U4 U. S. Pipe & Foundry Co., Birmingham  
W1 Wallingford Steel Co., Wallingford, Conn.  
W2 Washington Steel Corp., Washington, Pa.  
W3 Weirton Steel Co., Weirton, W. Va.  
W4 Wheatland Tube Co., Wheatland, Pa.  
W5 Wheeling Steel Corp., Wheeling, W. Va.  
W6 Wickwire Spencer Steel Div., Buffalo  
W7 Wilson Steel & Wire Co., Chicago  
W8 Wisconsin Steel Co., S. Chicago, Ill.  
W9 Woodward Iron Co., Woodward, Ala.  
W10 Wyckoff Steel Co., Pittsburgh  
W11 Worcester Pressed Steel Co., Worcester, Mass.  
W12 Wallace Barnes Steel Div., Bristol, Conn.  
Y1 Youngstown Sheet & Tube Co., Youngstown, O.

## PIPE AND TUBING

Base discounts (per cent) l.o.h. mills. Base price about \$200 per net ton

	BUTTWELD												SEAMLESS											
	1/2 In.		3/4 In.		1 In.		1 1/4 In.		1 1/2 In.		2 In.		2 1/2-3 In.		2 In.		2 1/2 In.		3 In.		3 1/2-4 In.			
	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.	Bk.	Gal.
<b>STANDARD T. &amp; C.</b>																								
Sparrows Pt. B3	16.50	1.25	19.50	5.25	22.00	8.75	24.50	9.50	25.00	10.50	25.50	11.00	27.00	10.75										
Youngstown R3	18.50	1.25	21.50	5.25	24.00	8.75	26.50	10.00	27.00	11.00	27.50	11.50	29.00	11.75										
Fontana K1	6.00	13.25	9.00	+9.25	11.50	+5.75	14.00	+4.00	14.50	+3.00	15.00	+2.50	16.50	+1.75										
Pittsburgh J3	18.50	1.25	21.50	7.25	24.00	10.75	26.50	11.50	27.00	12.50	27.50	13.00	29.00	12.75	6.50	+8.50	10.50	+6.25	13.00	+3.75	14.50	+2.25		
Alton, Ill. L1	16.50	1.25	19.50	5.25	22.00	8.75	24.50	9.50	25.00	10.50	25.50	11.00	27.00	10.75										
Sharon M2	18.50	3.25	21.50	7.25	24.00	10.75	26.50	11.50	27.00	12.50	27.50	13.00	29.00	12.75										
Fairless N2	16.50	1.25	19.50	5.25	22.00	8.75	24.50	9.50	25.00	10.50	25.50	11.00	27.00	10.75										
Pittsburgh N1	18.50	3.25	21.50	7.25	24.00	10.75	26.50	11.50	27.00	12.50	27.50	13.00	29.00	12.75	6.50	+8.50	10.50	+6.25	13.00	+3.75	14.50	+2.25		
Wheeling W3	18.50	3.25	21.50	7.25	24.00	10.75	26.50	11.50	27.00	12.50	27.50	13.00	29.00	12.75										
Wheatland W4	18.50	3.25	21.50	7.25	24.00	10.75	26.50	11.50	27.00	12.50	27.50	13.00	29.00	12.75	6.50	+8.50	10.50	+6.25	13.00	+3.75	14.50	+2.25		
Youngstown Y1	18.50	3.25	21.50	7.25	24.00	10.75	26.50	11.50	27.00	12.50	27.50	13.00	29.00	12.75										
Indiana Harbor Y1	17.50	2.25	20.50	6.25	23.00	9.75	25.50	10.00	26.00	11.50	26.50	12.00	28.00	11.75										
Lorain N2	18.50	3.25	21.50	7.25	24.00	10.75	26.50	11.50	27.00	12.50	27.50	13.00	29.00	12.75	6.50	+8.50	10.50	+6.25	13.00	+3.75	14.50	+2.25		
<b>EXTRA STRONG</b>																								
<b>PLAIN ENDS</b>																								
Sparrows Pt. B3	21.00	7.25	25.00	11.25	27.00	14.75	27.50	13.50	28.00	14.50	28.50	15.00	29.00	13.75										
Youngstown R3	23.00	7.25	27.00	11.25	29.00	14.75	29.50	14.00	30.00	15.00	30.50	15.50	31.00	14.75										
Fairless N2	21.00	7.25	25.00	11.25	27.00	14.75	27.50	13.50	28.00	14.50	28.50	15.00	29.00	13.75										
Fontana K1	10.50		14.50		16.50		17.00		17.50		18.00		18.50											
Pittsburgh J3	23.00	9.25	27.00	13.25	29.00	16.75	29.50	15.50	30.00	16.50	30.50	17.00	31.00	15.75	8.00	+6.00	13.00	+2.75	15.50	+0.25	20.50	4.75		
Alton, Ill. L1	21.00	7.25	25.00	11.25	27.00	14.75	27.50	13.50	28.00	14.50	28.50	15.00	29.00	13.75										
Sharon M3	23.00	9.25	27.00	13.25	29.00	16.75	29.50	15.50	30.00	16.50	30.50	17.00	31.00	15.75										
Pittsburgh N1	23.00	9.25	27.00	13.25	29.00	16.75	29.50	15.50	30.00	16.50	30.50	17.00	31.00	15.75										
Wheeling W3	23.00	9.25	27.00	13.25	29.00	16.75	29.50	15.50	30.00	16.50	30.50	17.00	31.00	15.75										
Wheatland W4	23.00	9.25	27.00	13.25	29.00	16.75	29.50	15.50	30.00	16.50	30.50	17.00	31.00	15.75										
Youngstown Y1	23.00	9.25	27.00	13.25	29.00	16.75	29.50	15.50	30.00	16.50	30.50	17.00	31.00	15.75	8.00	+6.00	13.00	+2.75	15.50	+0.25	20.50	4.75		
Indiana Harbor Y1	22.00	8.25	26.00	12.25	28.00	15.75	28.50	14.50	29.00	15.50	29.50	16.00	30.00	14.75										
Lorain N2	21.00	9.25	27.00	13.25	29.00	16.75	29.50	15.50	30.00	16.50	30.50	17.00	31.00	15.75	8.00	+6.00	13.00	+2.75	15.50	+0.25	20.50	4.75		

Threads only, butt weld and seamless 2 1/2 pt. higher discount. Plain ends, butt weld and seamless, 3-in. and under, 5 1/2 pt. higher discount.  
Galvanized discounts based on zinc price range of over 9¢ to 11¢ per lb. East St. Louis. For each 2¢ change in zinc, discounts vary as follows: 1/2, 3/4 and 1-in., 2 pt.; 1 1/4, 1 1/2 and 2-in., 1 1/2 pt.; 2 1/2 and 3-in., 1 pt., e.g., zinc price range of over 11¢ to 13¢ would lower discounts; zinc price in range over 7¢ to 9¢ would increase discounts. East St. Louis zinc price now 13.50¢ per lb.

(Effective April 24, 1956)

To identify producers, see Key on preceding page.

**TOOL STEEL**

F.o.b. mill

W	Cr	V	Mo	Co	per lb	SAE
18	4	1	—	—	\$1.60	T-1
18	4	1	—	5	2.305	T-4
18	4	2	—	—	1.765	T-2
1.5	4	1.5	8	—	.96	M-1
6	4	3	6	—	1.35	M-3
6	4	2	5	—	1.105	M-2

High-carbon chromium... .77 D-3, D-5  
 Oil hardened manganese .43 O-2  
 Special carbon .39 W-1  
 Extra carbon .23 W-1  
 Regular carbon .275 W-1  
 Warehouse prices on and east of Mississippi are 4¢ per lb higher. West of Mississippi, 6¢ higher.

**CLAD STEEL**

Base prices, cents per lb f.o.b.

Cladding	Plate (A3, J2, L4)			Sheet (J2)
	10 pct	15 pct	20 pct	
304	30.30	33.15	36.05	32.50
316	35.50	38.45	41.40	47.00
321	32.00	34.85	37.75	37.25
347	34.40	37.90	41.40	48.25
405	25.80	29.60	33.35	—
410, 430	25.30	29.10	32.85	—

CR Strip (S9) Copper, 10 pct, 2 sides, 33.00; 1 side, 30.00.

**WARE-HOUSES**

Cities	City Delivery Charge	Sheets			Strip		Plates	Shapes	Bars		Alloy Bars				
		Hot-Rolled	Cold-Rolled	Galvanized (10 yrs)	Hot-Rolled	Cold-Rolled			Standard Structural	Hot-Rolled	Cold-Finished	Hot-Rolled 4015 As rolled	Hot-Rolled 4140 Annealed	Cold-Drawn 4015 As rolled	Cold-Drawn 4140 Annealed
Baltimore	\$.10	7.31	8.32	8.37	7.65	7.63	7.93	7.61	8.62	14.38	13.44-13.96	16.36	16.29-16.49		
Birmingham	.15	6.80	7.93	8.85	7.06	6.99	7.28	7.08	9.35						
Boston	.10	8.22	9.17	10.42	8.31	8.51	8.37	8.37	9.83		13.66		16.76		
Buffalo	.15	7.35	8.40	10.16	7.50	7.80	7.75	7.50	8.05		13.45		16.50		
Chicago	.15	7.28	8.39	9.25	7.36	7.60	7.58	7.42	7.90		13.20		16.30		
Cincinnati	.15	7.40	8.38	9.10	7.60	7.89	8.05	7.66	8.30	13.59	13.29	16.44	16.39		
Cleveland	.15	7.28	8.39	9.10	7.46	7.77	7.91	7.48	8.15	13.41	13.11	16.26	16.21		
Denver		8.60	10.76	11.22	8.90	8.60	8.75	8.90	9.82				17.97		
Detroit	.15	7.47	8.58	9.53	7.49	7.88	8.05	7.70	8.19	13.70	13.40	16.55	16.50		
Houston		7.85	8.75	10.48	8.15	7.80	8.20	8.25	9.85-9.95	14.35	14.00	17.15	17.05		
Kansas City	.20	7.47	8.76	9.17	7.73	7.66	7.95	7.75	8.52	13.87	13.52	16.72	16.57		
Los Angeles	.10	8.25	10.10	11.10	8.60	8.85	8.40	8.25	11.00		14.45		18.00		
Memphis	.10	7.12	8.25		7.38	7.31	7.60	7.40	9.15						
Milwaukee	.15	7.37	8.48	9.34	7.45	7.69	7.75	7.51	8.09		13.29		16.39		
New Orleans	.15	7.20	8.35		7.45	7.40	7.70	7.50	9.55						
New York	.10	7.88	8.98	9.73	8.33	8.31	8.21	8.26	9.87		13.57		16.67		
Norfolk	.20	7.25			7.65	7.45	7.95	7.65	9.50						
Philadelphia	.10	7.44	8.54	9.51	8.09	7.82	7.85	7.83	8.62		13.35		16.45		
Pittsburgh	.15	7.28	8.39	9.55	7.46	7.60	7.58	7.42	8.00	13.35	13.05	16.20	16.15		
Portland		7.80-8.60	8.80-10.15	10.65	8.00	7.95	7.75	7.85-8.15	9.20	12.20	15.00		17.50		
Salt Lake City	.20		10.60		9.35		9.20	9.15							
San Francisco	.10	8.30	9.75	10.25	8.45	8.40	8.35	8.25	11.55		14.45		18.00		
Seattle	.00	8.75	10.50	10.90	8.90	8.50	8.50	8.60	12.25		14.65				
St. Louis	.15	7.57	8.68	9.54	7.65	7.89	7.98	7.71	8.44		13.49		16.56		
St. Paul	.25	7.94	8.50-9.14	9.89	7.72	7.65	7.94	7.74	8.51		13.51		16.31		

Base Quantities (Standard unless otherwise keyed): Cold finished bars: 2000 lb or over. Alloy bars: 1000 to 1999 lb. All others: 2000 to 9999 lb. All HR products may be combined for quantity. All galvanized sheets may be combined for quantity. CR sheets may not be combined with each other or with galvanized sheets for quantity.  
 Exceptions: (1) 1500 to 9999 lb. (2) 1000 lb or over. (3) \$.25 delivery. (4) 1000 to 1999 lb. \$.25 delivery.  
 \*Plus analysis charge. †Deduct for country delivery.

**ELECTRICAL SHEETS**

22-Gage F.o.b. Mill Cents Per Lb	Hot-Rolled (Cut Lengths)*	Cold-Reduced (Coiled or Cut Length)	
		Semi-Processed	Fully Processed
Field	8.60	8.60	—
Armature	9.35	9.60	10.10
Elect.	9.95	10.20	10.70
Motor	10.95	11.20	11.70
Dynamo	11.85	12.10	12.60
Trans. 72	12.80	13.05	13.55
Trans. 65	13.35	Grain Oriented	
Trans. 58	13.85	Trans. 80	17.45
Trans. 52	14.85	Trans. 73	17.95

Producing points: Beech Bottom (W5); Brackenridge (A3); Granite City (G7); Indiana Harbor (I3); Mansfield (E2); Newport, Ky. (N5); Niles, O. (N3); Vandergrift (U1); Warren, O. (R3); Zanesville (A7).  
 \* Coils 75c higher.

**LAKE SUPERIOR ORES**

51.50% Fe natural content, delivered lower Lake ports. Prices for 1956 season. Freight changes for seller's account.

	Gross Ton
Openhearth lump	\$12.10
Old range, bessemer	11.25
Old range, nonbessemer	11.10
Mesabi, bessemer	11.00
Mesabi, nonbessemer	10.85
High phosphorus	10.85

**MERCHANT WIRE PRODUCTS**

F.o.b. Mill	Standard & Coated Nails		Woven Wire Fence 9-15 1/2 ga.		Type Fence Posts		Single Loop Bale Ties		Galv. Barbed and Twisted Barbless Wire		Merch. Wire Ann'd		Merch. Wire Galv.	
	Col	Cal	Col	Cal	Col	Cal	Col	Cal	Col	Cal	Col	Cal	Col	Cal
Alabama City R3	152	162	—	—	173	175	7.40	7.80	—	—	—	—	—	—
Aliquippa, Pa. J3	152	162	—	—	—	—	7.40	7.80	—	—	—	—	—	—
Atlanta A8	154	167	—	—	177	180	7.60	8.125	—	—	—	—	—	—
Bartonsville K2	154	168	—	—	175	181	7.60	8.20	—	—	—	—	—	—
Buffalo W6	—	—	—	—	—	—	7.50	7.90	—	—	—	—	—	—
Chicago, Ill. N4**	152	166	—	—	175	179	7.50	8.10	—	—	—	—	—	—
Cleveland A6	157	—	—	—	—	—	7.50	—	—	—	—	—	—	—
Cleveland A5	—	—	—	—	—	—	7.40	—	—	—	—	—	—	—
Crawfordsville M4	154	168	—	—	177	181	7.60	8.20	—	—	—	—	—	—
Donora, Pa. A5	152	162	—	—	175	175	7.50	7.90	—	—	—	—	—	—
Duluth A5	152	162	—	—	175	175	7.50	7.90	—	—	—	—	—	—
Fairfield, Ala. T2	152	162	—	—	175	175	7.50	7.90	—	—	—	—	—	—
Galveston D4	157	—	—	—	—	—	7.65	8.05	—	—	—	—	—	—
Houston S2	157	170	—	—	180	180	7.65	8.05	—	—	—	—	—	—
Johnstown, Pa. B3*	152	166	—	—	175	175	7.40	7.80	—	—	—	—	—	—
Joliet, Ill. A5	152	162	—	—	175	175	7.50	8.10	—	—	—	—	—	—
Kokomo, Ind. C9	154	154	—	—	177	177	7.60	8.00	—	—	—	—	—	—
Laurensville K2	157	167	—	—	178	180	7.65	8.05	—	—	—	—	—	—
Kansas City S2	157	167	162	178	180	7.65	8.05	—	—	—	—	—	—	—
Minneapolis C6	157	167	162	178	180	7.65	8.05	—	—	—	—	—	—	—
Monsanto P6	152	162	—	—	—	—	7.40	7.80	—	—	—	—	—	—
Moline, Ill. R3	162	162	—	—	—	—	—	—	—	—	—	—	—	—
Pittsburgh, Cal. C7	171	185	—	—	199	195	8.45	8.85	—	—	—	—	—	—
Portsmouth P7	—	—	—	—	—	—	7.50	—	—	—	—	—	—	—
Randall, Pa. A5	152	162	—	—	175	175	7.40	7.80	—	—	—	—	—	—
Se. Chicago R3	152	162	157	173	175	7.40	7.80	—	—	—	—	—	—	—
San Francisco C6	—	—	—	—	197	195	8.35	8.75	—	—	—	—	—	—
Sparks Pt. B3*	154	—	—	—	175	181	7.60	8.20	—	—	—	—	—	—
Struthers, O. Y1	—	—	—	—	—	—	7.40	7.90	—	—	—	—	—	—
Worcester A5	158	—	—	—	—	—	7.70	8.20	—	—	—	—	—	—
Williamsport, Pa. S5	—	—	160	—	—	—	—	—	—	—	—	—	—	—

Galvanized products computed with zinc at 5¢ per lb. Exceptions: \*zinc at 12.5¢ per lb; \*\*13¢ zinc.

**C-R SPRING STEEL**

Cents Per Lb F.o.b. Mill	CARBON CONTENT				
	0.28-0.41	0.41-0.61	0.61-0.81	0.81-1.05	1.05-1.35
Bristol, Conn. W12	—	10.90	13.05	15.75	—
Buffalo, N. Y. R7	7.00	8.95	10.50	12.65	15.35
Carnegie, Pa. S9	—	9.05	10.60	12.75	15.35
Cleveland A5	7.10	9.05	10.60	12.75	15.45
Detroit D1	7.20	9.15	10.70	12.85	—
Detroit D2	7.20	9.15	10.70	—	—
Harrison, N. J. C11	—	10.90	13.05	15.75	—
Indianapolis C5	7.15	9.10	10.50	12.65	15.35
New Castle, Pa. B4	7.00	8.95	10.50	12.65	—
New Haven, Conn. D1	7.55	9.35	10.90	13.05	—
Pawtucket, R. I. N7	7.65	9.35	10.90	13.05	15.75
Pittsburgh S7	7.10	9.05	10.60	12.75	15.45
Riverdale, Ill. A1	7.20	9.05	10.60	12.75	15.45
Sharon, Pa. S1	7.10	9.05	10.60	12.75	15.45
Trenton R4	—	—	—	—	—
Wallingford W1	7.55	9.35	10.90	13.05	15.75
Warren, Ohio T4	7.00	8.95	10.50	12.65	15.35
Weirton, W. Va. W3	7.10	8.95	10.50	—	—
Worcester, Mass. A5	7.65	9.35	10.90	13.05	15.75
Youngstown C3	7.00	8.95	10.50	12.65	15.35

**BOILER TUBES**

\$ per 100 ft. carload lots, cut 10 to 24 ft. F.o.b. Mill	Size		Seamless		Elec. Weld	
	OD-In.	B.W. Ga.	H.R.	C.D.	H.R.	C.D.
Babcock & Wilcox.	2	13	39.87	36.51	29.93	
	2 1/2	12	41.57	40.16	40.31	
	3	12	47.99	56.76	46.55	
	3 1/2	11	56.03	66.27	54.34	
	4	10	74.41	88.00	72.17	
National Tube . . . .	2	13	39.87	36.51	29.93	
	2 1/2	12	42.57	49.16	40.31	
	3	12	47.99	56.76	46.55	
	3 1/2	11	56.03	66.27	54.34	
	4	10	74.41	88.00	72.17	
Pittsburgh Steel . . .	2	13	39.87	36.51		
	2 1/2	12	41.57	49.16		
	3	12	47.99	56.76		
	3 1/2	11	56.03	66.27		
	4	10	74.41	88.00		

## RAILS, TRACK SUPPLIES

F.o.b. Mill Cents Per Lb	No. 1 Std. Rail	Light Rail	Joint Bars	Track Spikes	Screw Spikes	Tie Plates	Track Bole Uncoated
Beaumont U1	4.725	5.65	5.825				
Se. Chicago R3				8.05			
Enley T2	4.725	5.65					
Fairfield T2		5.65		8.05		5.625	
Gary U1	4.725	5.65			5.625		
Ind. Harbor J3	4.725	5.825	7.90		5.625		
Ind. Harbor V1		5.65		7.90			
Johnstown B3		5.65	5.825				
Juliet U1		5.65	5.825				
Kansas City S2				7.90			
Leakawanna B3	4.725	5.65	5.825		5.625		
Lebanon B3						12.15	
Minneapolis C6	4.725	6.15	5.825	7.90	5.825	12.15	
Pittsburgh O1				11.90		12.15	
Pittsburgh P5						12.15	
Pittsburgh J3				7.90			
Seattle B2				8.40	5.775	12.65	
Steelton B3	4.725	5.825			5.625		
Struthers Y1				7.90			
Terrace C7					5.775		
Williamsport S3		5.65					
Youngstown R3				8.05			

## COKE

Furnace, beehive (f.o.b. oven)	Net-Ton
Connellsville, Pa.	\$14.50
Foundry, beehive (f.o.b. oven)	
Connellsville, Pa.	\$17.00 to \$18.00
Foundry, oven coke	
Buffalo, del'd	\$28.75
Chicago, f.o.b.	27.00
Detroit, f.o.b.	27.50
New England, del'd	28.55
Seaboard, N. J., f.o.b.	26.75
Philadelphia, f.o.b.	26.50
Swedeland, Pa., f.o.b.	26.50
Painesville, Ohio, f.o.b.	27.50
Erle, Pa., f.o.b.	27.50
Cleveland, del'd	29.43
Cincinnati, del'd	28.59
St. Paul, f.o.b.	26.50
St. Louis, f.o.b.	28.50
Birmingham, f.o.b.	25.65
Lone Star, Tex., f.o.b.	19.50

## ELECTRODES

Cents per lb f.o.b. plant, threaded, with nipples, unboxed.

GRAPHITE			CARBON*		
Diam. (in.)	Length (in.)	Price	Diam. (in.)	Length (in.)	Price
24	84	23.00	40	100, 110	9.90
20	72	22.25	35	110	9.90
16 to 18	72	22.50	30	110	10.05
14	72	23.00	24	72 to 84	10.30
12	72	23.50	20	90	10.10
10	60	24.25	17	72	10.35
7	60	24.50	14	72	10.85
5	60	27.25	12	60	11.75
4	40	30.25	10	60	11.80
3	40	32.90	8	60	12.10
2½	30	33.75			
2	24	32.50			

\* Prices shown cover carbon nipples.

## ELECTROPLATING SUPPLIES

Anodes	
(Cents per lb, f.o.b. shipping point)	
Copper	
Cast elliptical, 18 in. or longer,	
5000 lb lots	58.92
Electrodeposited	55.25
Brass, 80-20, ball anodes, 2000 lb	
or more	58.00
Zinc, ball anodes, 2000 lb lots	20.75
(for elliptical add 2¢ per lb)	
Nickel, 99 pct plus, rolled carbon	90.50
(rolled depolarized add 3¢ per lb)	
Cadmium	\$1.70
Tin, ball anodes and elliptical	\$1.06 to \$1.10
Chemicals	
(Cents per lb, f.o.b. shipping point)	
Copper cyanide, 100 lb drum	\$3.50
Copper sulphate, 5 or more 100 lb	
bags, per cwt	18.15
Nickel salts, single, 4-100 lb bags	33.25
Nickel chloride, freight allowed,	
300 lbs	43.50
Sodium cyanide, domestic, fob N. Y.	
1 to 4 200 lb drums	21.55
(Philadelphia add .50 per lb)	
Zinc cyanide, 100 to 900 lb	55.55
Potassium cyanide, 100 lb drum	
N. Y.	48.00
Chromic acid, flake type, 1 to 20	
100 lb drums	\$1.20

## BOLTS, NUTS, RIVETS, SCREWS

(Base discount, f.o.b. mill)

## Machine and Carriage Bolt

	Discount	Full case	Full case
		case 20,000 lb.	Quantity or more
½ in. & smaller x 6 in. &			
shorter	61	63	
Larger than ½ in. diam. and			
all diam. longer than 6 in.	55	57	
Rolled thread carriage bolts			
½ in. & smaller x 6 in. and			
shorter	61	63	
Lag, all diam. x 6 in. &			
shorter	61	63	
Lag, all diam. longer than			
6 in.	55	57	
Plow bolts	61	63	

## Nuts, Hex, HP, reg. &amp; hvy.

¾" or smaller	64	66
¾" to 1¼" inclusive	63	65
1¼" to 1½" inclusive	65	67
1½" and larger	61	63

## C.P. Hex regular &amp; hvy.

¾" or smaller	64	66
¾" and larger	61	63

## Hot Galv. Nuts (all types)

1½" or smaller	44	47
----------------	----	----

## Finished, Semi-finished, Hex Nuts

¾" and smaller	66	66
¾" and larger	63	63
Add 25% for less than case or keg quantity.		

## Rivets

	Base per 100 lb
½ in. and larger	\$9.95
	Pct Off List
7/16 in. and smaller	32

## Cap Screws

	Discount	H.C. Heat
	Bright Treated	
New std. hex head, pack-		
aged		
¼" thru ½" diam. x 6"	34	29
and shorter		
9/16" and ¾" x 6" and	31	16
smaller and shorter		
¾", 1" x 6" and	9	+11
shorter		
New std. hex head, bulk*		
¼" thru ½" diam. x 6"	49	41
and shorter		
9/16" and ¾" diam. x 6"	43	39
and shorter		
¾", 1" x 6" and	31	20
shorter		
*Minimum quantity per item:		
15,000 pieces ¼", 5/16", ¾" diam.		
5,000 pieces 7/16", 1½", 9/16", ¾" diam.		
2,000 pieces ¾", 1", 1" diam.		

## Machine Screws &amp; Stove Bolts

	Discount	Mach. Stove
		Screws Bolts
Packaged, package list ...	27	38
Bulk, bulk list		
Quantity		
¼ in. diam.	25,000-200,000	20 61
& under		
5/16 in. diam. &	15,000-100,000	20 61
larger		
All diam. over 3 in. long	5,000-100,000	— 61

## Machine Screw &amp; Stove Bolt Nuts

	Discount	Hex Square
Packaged, package list ...	24	27
Bulk, bulk list		
Quantity		
¾ in. diam. & smaller	25,000-200,000	18 20

## CAST IRON WATER PIPE INDEX

Birmingham	111.3
New York	123.5
Chicago	124.9
San Francisco-L. A.	133.1
Dec. 1955 value, Class B or heavier	
6 in. or larger, bell and spigot pipe. Ex-	
planation: p. 57, Sept. 1 issue. Source:	
U. S. Pipe and Foundry Co.	

## REFRACTORIES

Fire Clay Brick	Carloads per 1000
First quality, Ill., Ky., Md., Mo., Ohio, Pa.	
(except Salina, Pa., add \$5.00)	\$122.00
No. 1 Ohio	
Sec. quality, Pa., Md., Ky., Mo., Ill.	114.00
No. 2 Ohio	98.00
Ground fire clay, net ton, bulk	
(except Salina, Pa., add \$1.50)	18.00

## Silica Brick

Mt. Union, Pa., Ensley, Ala.	\$128.00
Childs, Hays, Pa.	138.00
Chicago District	138.00
Western Utah	144.00
California	151.00
Super Duty	
Hays, Pa., Athens, Tex., Wind-	
ham, Warren, O.	145.00
Curtner, Calif.	163.00
Silica cement, net ton, bulk, East-	
ern (except Hays, Pa.)	21.00
Silica cement, net ton, bulk, Hays,	
Pa.	24.00
Silica cement, net ton, bulk, Chi-	
cago District, Ensley, Ala.	22.00
Silica cement, net ton, bulk, Utah	
and Calif.	32.00

## Chrome Brick

Standard chemically bonded, Balt.	\$91.00
Standards chemically bonded, Curt-	
ner, Calif.	101.25
Burned, Balt.	85.00

## Magnesite Brick

Standard Baltimore	\$114.00
Chemically bonded, Baltimore	102.00

## Grain Magnesite

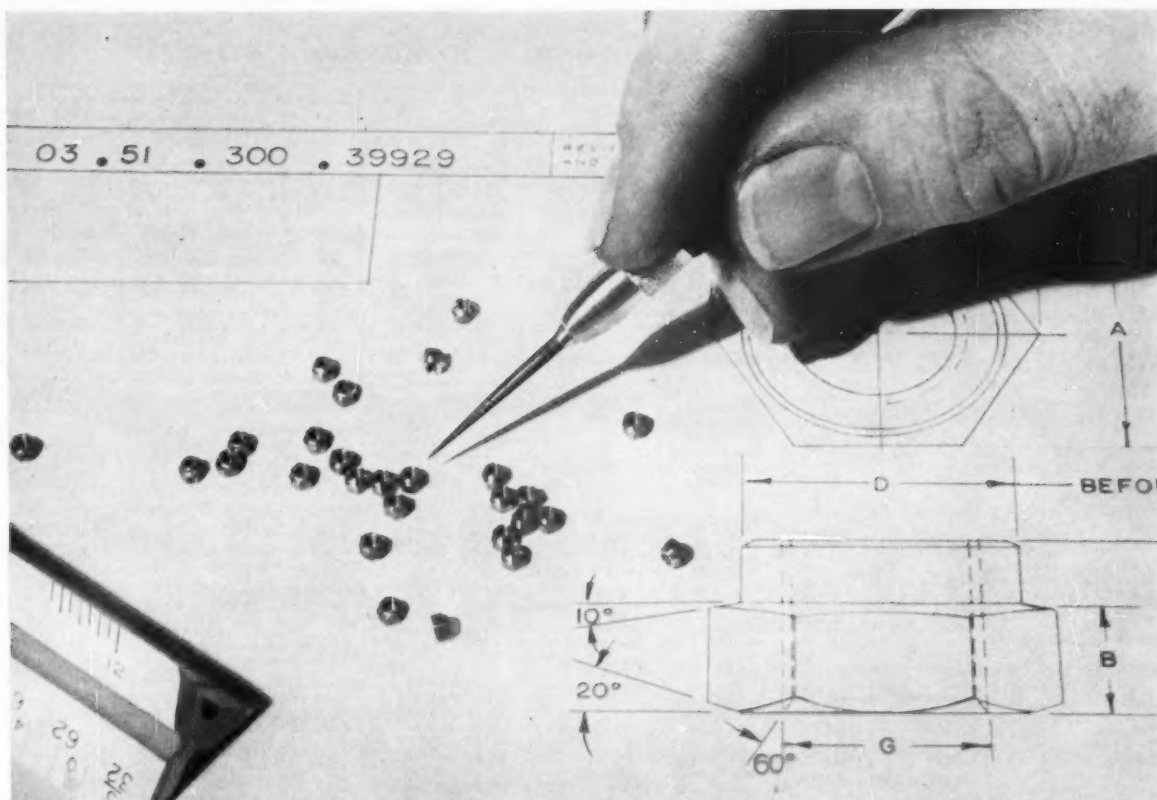
Domestic, f.o.b. Baltimore	St. ¼-in. grains
In bulk fines removed	\$64.00
Domestic, f.o.b. Chewelah, Wash.,	
Luning, Nev.	
In bulk	40.00
In sacks	46.00

## Dead Burned Dolomite

F.o.b. bulk, producing points in:	Per net ton
Pa., W. Va., Ohio	\$15.00
Midwest	15.60
Missouri Valley	14.00

## METAL POWDERS

Per pound, f.o.b. shipping point, in ton	
lots, for minus 100 mesh.	
Swedish sponge iron c.i.f.	
New York, ocean bags ...	9.50¢
Canadian sponge iron,	
Del'd in East, carloads ...	9.5¢
Domestic sponge iron, 98+%	
Fe, carload lots	9.5¢
Electrolytic iron, annealed,	
imported 99.5+%	27.5¢
domestic 99.5+%	36.5¢
Electrolytic iron, unannealed	
minus 325 mesh, 99+%	57.0¢
Electrolytic iron melting	
stock, 99.84% pure	22.0¢
Carbonyl iron size 5 to 10	
micron, 98%, 00.8+%	\$6.0¢ to \$1.55
Aluminum freight allowed	33.00¢
Brass, 10 ton lots	\$7.50¢ to \$10.00¢
Copper, electrolytic	\$1.50¢
Copper, reduced	\$1.50¢
Cadmium, 100-199 lb. 95¢ plus metal value	
Chromium, electrolytic 99.85%	
min. Fe .03 max. Del'd	\$5.00
Lead	7.50¢ plus metal value
Manganese	70.0¢
Molybdenum, 99%	\$3.00 to \$3.25
Nickel, unannealed	\$1.00
Nickel, annealed	\$1.06
Nickel, spherical, unannealed,	
#20	\$1.15
Silicon	43.50¢
Solder powder	7.0¢ to 9.0¢ plus met. value
Stainless steel, 302	99.0¢
Stainless steel, 316	\$1.32
Tin	14.00¢ plus metal value
Tungsten, 99% (65 mesh)	\$4.50
Zinc, 1¢ ton lots	\$18.75¢ to \$25.50¢



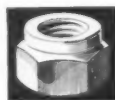
**FLEXLOC MICROSIZE** locknuts meet designers' needs for tiny precision nuts that retain strength and holding power in the smallest assemblies—servomechanisms, electronic and electrical equipment, all miniature devices.

## Design Lighter, More Compact Products with New FLEXLOC Microsize Locknuts

Standard Microsize Locknuts Permit Design Engineers to Develop and Fasten Smaller Assemblies Safely

SIZE	Across Flats		Shoulder Height		Across Corners	Height +.000 -.003
	MAX.	MIN.	MAX.	MIN.	MIN.	
0-80 NF-3B	.111	.107	.047	.042	.123	.075
1-64 NC-3B	.127	.123	.0635	.0585	.141	.090
1-72 NF-3B	.127	.123	.0635	.0585	.141	.090
2-56 NC-3B	.158	.153	.068	.063	.176	.105
2-64 NF-3B	.158	.153	.068	.063	.176	.105
3-48 NC-3B	.190	.183	.071	.066	.210	.120
3-56 NF-3B	.190	.183	.071	.066	.210	.120
4-40 NC-3B	.190	.183	.072	.067	.210	.120
4-48 NF-3B	.190	.183	.072	.067	.210	.120

**STANDARD MICROSIZE FLEXLOCs**—in sizes ranging from 0-80 to 4-48—are available in brass (either plain or cadmium plated). Consult SPS for miniature nuts of other conventional materials.



New FLEXLOC Microsize locknuts are smaller and lighter than regular FLEXLOCs of the same nominal diameter. Wrenches of smaller size are used to install them. Mating joints or flanges can be designed smaller—with no loss in strength or convenience of assembly.

Microsize FLEXLOCs have all the advantages of larger FLEXLOCs. One-piece, all-metal construction—nothing to put together, come apart, lose or forget. Use them as lock or stop nuts—they stay put anywhere on a threaded member as soon as the locking threads are fully engaged. Uniform locking torques insure accurate preloading. There are no nonmetallic inserts to pop out or deteriorate. Moisture, dryness, oil, temperatures to 250°F won't affect these Microsize FLEXLOCs. Just screw them on. They lock and stay locked. Vibration won't shake them loose.

For complete information on Microsize FLEXLOCs, consult your authorized SPS distributor. Or write STANDARD PRESSED STEEL CO., Jenkintown 17, Pa.

STANDARD PRESSED STEEL CO.

**FLEXLOC** LOCKNUT DIVISION

**SPS**

JENKINTOWN PENNSYLVANIA

# Ferroalloy Prices

(Effective April 24, 1966)

## Ferrochrome

Contract prices, cents per lb contained Cr, lump, bulk carloads, del'd, 67-71% Cr, 30-1.00% max. Si.			
0.02% C	38.50	0.20% C	35.50
0.03% C	38.00	0.50% C	35.25
0.06% C	36.50	1.00% C	34.00
0.10% C	36.00	1.50% C	33.85
0.15% C	35.75	2.00% C	33.75
4.00-4.50 C, 67.70% Cr, 1-2% Si	26.25		
3.50-5.00% C, 57-64% Cr, 2.00-4.50% Si	25.00		
0.025% C (Simplex)	31.75		

## High Nitrogen Ferrochrome

Low-carbon type 0.75% N. Add 5¢ per lb to regular low carbon ferrochrome price schedule. Add 5¢ for each additional 0.25% of N.

## Chromium Metal

Contract prices, per lb chromium contained, packed, delivered, ton lots, 97% min. Cr, 1% max. Fe.	
0.10% max. C	\$1.27
0.50% max. C	1.27
9 to 11% C, 88-91% Cr, 0.75% Fe.	1.36

## Electrolytic Chromium Metal

Contract prices per lb of metal 2" x D plate (1/4" thick) delivered packed, 99.80% min. Cr. (Metallic Base) Fe 0.20 max.	
Carloads	1.25
Ton lots	1.27
Less ton lots	1.29

## Low Carbon Ferrochrome Silicon

(Cr 34-41%, Si 42-45%, C 0.05% max.)	
Contract price, carloads, delivered, lump, 3-in. x down, per lb of Cr, packed.	
Carloads	41.85
Ton lots	46.15
Less ton lots	46.65

## Calcium-Silicon

Contract price per lb of alloy, lump, delivered, packed.	
30-33% Cr, 60-65% Si, 3.00 max. Fe.	
Carloads	22.95
Ton lots	25.25
Less ton lots	26.75

## Calcium-Manganese-Silicon

Contract prices, cents per lb of alloy, lump, delivered, packed.	
16-20% Ca, 14-18% Mn, 53-59% Si.	
Carloads	23.05
Ton lots	24.95
Less ton lots	25.95

## SMZ

Contract prices, cents per pound of alloy, delivered, 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe 1/2 in. x 12 mesh.	
Ton lots	19.65
Less ton lots	20.90

## V Foundry Alloy

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis, V-5; 38-42% Cr, 17-19% Si, 8-11% Mn, packed.	
Carload lots	17.20
Ton lots	18.70
Less ton lots	19.95

## Graphidex No. 4

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis, Si 48 to 52%, Ti 9 to 11%, Ca 6 to 7%.	
Carload packed	18.50
Ton lots to carload packed	19.65
Less ton lots	20.90

## Ferromanganese

Maximum contract base price, f.o.b., lump size, base content 74 to 76 pct Mn.	
	Cents per-lb
Producing Point	
Marietta, Ashabula, O.: Alloy, W. Va.; Sheffield, Ala.; Portland, Ore.	10.75
Johnstown, Pa.	10.75
Sheridan, Pa.	10.75
Philo, Ohio	10.75
S. Duquesne	10.75
Add or subtract 0.1¢ for each 1 pct Mn above or below base content.	
Briquets, delivered, 66 pct Mn:	
Carloads, bulk	12.00
Ton lots packed	15.30

## Spiegeleisen

Contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.	
Manganese Silicon	
16 to 19% 3¢ max.	\$92.00
19 to 21% 3¢ max.	91.00
21 to 23% 3¢ max.	96.50

## Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, delivered.	
95.50% min. Mn, 0.2% max. C, 1% max. Si, 2.5% max. Fe.	
Carload, packed	45.75
Ton lots	47.25

## Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, f.o.b. Marietta, O., delivered, cents per pound.	
Carloads	31.5
Ton lots	33.5
250 to 1999 lb	35.5
Premium for hydrogen-removed metal	0.75

## Medium Carbon Ferromanganese

Mn 80% to 85%, C 1.25 to 1.50, Si 1.50% max. Contract price, carloads, lump, bulk, delivered, per lb of contained Mn.	
	22.85

## Low-Carb Ferromanganese

Contract price, cents per pound Mn contained, lump size, del'd Mn 85-90%.			
	Carloads	Ton	Less
0.07% max. C, 0.06% P, 90% Mn	34.00	36.55	37.75
0.07% max. C	31.95	34.50	35.70
0.10% max. C	31.20	33.75	34.95
0.15% max. C	30.45	33.00	34.20
0.30% max. C	28.95	31.50	32.70
0.50% max. C	28.45	31.00	32.20
0.75% max. C, 80-85% Mn, 5.0-7.0% Si	25.45	28.00	29.20

## Silicomanganese

Contract basis, lump size, cents per pound of metal, 65-68% Mn, 18-20% Si, 1.5% max. C for 2% max. C, deduct 0.2¢ f.o.b. shipping point.	
Carload bulk	12.00
Ton lots	13.45
Briquet contract basis carloads, bulk, delivered, per lb of briquet	13.55
Ton lots, packed	15.75

## Silvery Iron (electric furnace)

Si 15.50 to 16.00 pct, f.o.b. Keokuk, Iowa, or Wenatchee, Wash., \$100.00 gross ton, freight allowed to normal trade area. Si 15.01 to 15.50 pct, f.o.b. Niagara Falls, N. Y., \$93.00.	
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## Silicon Metal

Contract price, cents per pound contained Si, lump size, delivered, packed.	
	Ton lots Carloads
96.50% Si, 2% Fe	22.75 21.45
98% Si, 1% Fe	23.25 21.95

## Silicon Briquets

Contract price, cents per pound of briquets, bulk, delivered, 40% Si, 2 lb Si briquets.	
Carloads, bulk	7.15
Ton lots, packed	9.75

## Electric Ferrosilicon

Contract price, cents per lb contained Si, lump, bulk, carloads, f.o.b. shipping point.	
50% Si	12.75
65% Si	14.50
75% Si	15.40
85% Si	17.10
90% Si	18.50

## Calcium Metal

Eastern zone contract prices, cents per pound of metal, delivered.	
	Cast Turnings Distilled
Ton lots	\$2.05 \$2.95 \$3.75
Less ton lots	2.40 3.30 4.55

## Ferrovanadium

50-55% V contract, basis, delivered, per pound, contained V, carloads, packed.	
Openhearth	3.10
Crucible	3.20
High speed steel (Primos)	3.30

Al-sifer, 20% Al, 40% Si, 40% Fe. Contract basis, f.o.b. Suspension Bridge, N. Y., per lb.

Carloads	10.65¢
Ton lots	11.80¢

Calcium molybdate, 43.6-46.6% f.o.b. Langeloth, Pa., per pound contained Mo

	\$1.34
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Ferrocolumbium, 50-60%, 2 in. x D contract basis, delivered per pound contained Cb.

Ton lots	\$6.90
Less ton lots	6.95

Ferro-tantalum-columbium, 20% Ta, 40% Cb, 0.30% C, contract basis, del'd, ton lots, 2-in. x D per lb con't Sb plus Ta.

	\$4.65
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Ferromolybdenum, 55-75%, 200-lb containers, f.o.b. Langeloth, Pa., per pound contained Mo

	\$1.54
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Ferrophosphorus, electric, 23-26%, car lots, f.o.b. Siglo, Mt. Pleasant, Tenn., \$4.00 unitage, per gross ton

10 tons to less carload	\$90.00
	\$110.00

Ferrotitanium, 40% regular grade, 0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti

	\$1.35
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Ferrotitanium 25% low carbon, 0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti

	\$1.50
Less ton lots	\$1.55

Ferrotitanium, 15 to 18% high carbon, f.o.b. Niagara Falls, N. Y., freight allowed, carload, per net ton

	\$177.00
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Ferrotungsten, 1/4 x down, packed, per pound contained W, ton lots, delivered

	\$3.45
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Molybdenic oxide, briquets, per lb contained Mo, f.o.b. Langeloth, Pa.

	\$1.33
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base, f.o.b. Washington, Pa., Langeloth, Pa.

	\$1.30
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Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per lb.

Carload, bulk lump	17.50¢
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Ton lots, packed lump	19.50¢
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Less ton lots	20.00¢
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Vanadium oxide, 86-89% V<sub>2</sub>O<sub>5</sub> contract basis, per pound contained V<sub>2</sub>O<sub>5</sub>

	\$1.31
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Zirconium contract basis, per lb of alloy

35-40% f.o.b. freight allowed, carloads, packed	26.25¢
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12-15% del'd, lump, bulk-carloads	8.50¢
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## Boron Agents

Borasil, contract prices per lb of alloy del. f.o.b. Philo, Ohio, freight allowed, B 3.14%, Si 40-45%, per lb contained B

	\$5.25
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Bortam, f.o.b. Niagara Falls

Ton lots, per pound	45¢
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Less ton lots, per pound	50¢
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Corbortam, Ti 15-21%, B 1-2%, Si 2-4%, Al 1-2%, C 4.5-7.5% f.o.b. Suspension Bridge, N. Y., freight allowed

Ton lots per pound	10.00¢
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Ferroboration, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C, 1 in. x D, ton lots.

	1.20
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F.o.b. Wash., Pa.; Niagara Falls, N. Y., delivered 100 lb un

10 to 14% B	.85
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14 to 19% B	1.20
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19% min. B	1.50
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Grainal, f.o.b. Bridgeville, Pa., freight allowed, 100 lb and over

No. 1	\$1.05
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No. 79	50¢
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Manganese-Boron, 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C, 2 in. x D, del'd.

Ton lots	\$1.48
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Less ton lots	1.57
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Nickel-Boron, 15-18% B, 1.00% max. Al, 1.50% max. Si, 1.50% max. C, 3.00% max. Fe, balance Ni, del'd less ton lots

	\$2.05
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## Typical Mechanical Properties of Ni-Vee Bronzes

TYPE	A (lead free)			B (1% lead)		C (5% lead)		D (10% lead)		E (20% lead)	
	As Cast	Tempered	Heat-Treated	As Cast	Tempered	As Cast	Tempered	As Cast	Tempered	As Cast	Tempered
Tensile Strength (thousand psi)....	50	65	85	45	60	40	50	35	40	25	30
Yield Strength (thousand psi).....	22	40	55	20	30	20	30	20	25	18	22
Elongation, % in 2".....	40	10	10	30	8	15	5	10	2	5	2
Brinell Hardness.....	85	130	180	80	120	80	130	80	110	70	80

## Specifying is simple and systematic with 5 versatile Ni-Vee Bronzes

Now . . . designers and engineers can readily select a suitable bronze for any specific need . . . from only five Ni-Vee\* bronzes.

"As Cast," these five Ni-Vee bronzes provide mechanical properties that surpass those of comparable G bronze, red brasses and leaded bearing bronzes. What's more, their superior properties can be still further elevated by simple heat-treatments.

Basically, each Ni-Vee bronze contains 5% nickel and 5% tin, from 0 up to 20% of lead. Tensile strength ranges from 25 to 85 thousand psi, and hardness from 70 to 180 Brinell.

### Advantages

Just five of these Ni-Vee bronzes make it possible to standardize metal inventories, melting practices and shop operation . . . as well as specification . . . to meet many industrial uses for copper-base castings.

Each Ni-Vee bronze contains an optimum nickel content to raise levels of strength, hardness and toughness. In addition, this nickel content provides a high degree of corrosion resistance in the Ni-Vee bronzes. Negligible zinc content makes it free from dezincification. This spells resistance to stress-corrosion attack.

### A versatile family

Copper-base alloys are ordinarily used for the three types of castings listed below. For each of these applications a Ni-Vee bronze provides particular advantages:

- (1) **Constructional** castings — high strength
- (2) **Pressure** castings — fine grain
- (3) **Bearing** castings — resistance to wear and seizure

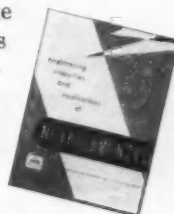
The simple family of five Ni-Vee bronzes actually replaces the confusing variety of miscellaneous bronzes. As a result, engineers and designers can now specify simply and systematically . . . specify Ni-Vee bronzes wherever possible. Parts cast in Ni-Vee bronze already serve electrical, power, steel, petroleum, chemical, automotive, aircraft, railroad and other industries.

### Engineering data for you

Learn how the Ni-Vee bronzes can simplify your specification work, improve product performance. Send for a copy of "Engineering Properties and Applications of Ni-Vee Bronzes."

It contains useful information like that given in the table above: tables of composition, charts on deformation, friction, fatigue, elevated temperature service, electrical resistivity, wear and other engineering data. Write for it now.

\*Registered trademark



**THE INTERNATIONAL NICKEL COMPANY, INC.**

67 Wall Street  
New York 5, N.Y.

*in a new car — in a used car —*  
**STAINLESS STEEL**  
**Sells and Re-sells!**



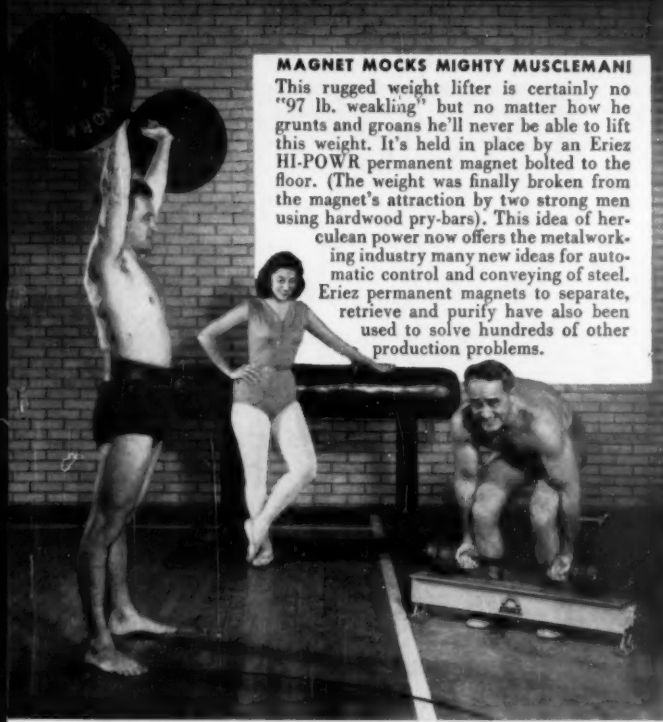
**McLOUTH**  
**STAINLESS**  
**STEEL**  
for automobiles

The Stainless Steel trim, molding and vital parts that add style and beauty to a car, inside and out, are features that help make the sale.

Stainless Steel has wide customer acceptance. It's easy to clean and keep clean. It's a tough, solid metal that will not corrode or dent and stands up to gravel, ice, salt and water.

The finish never fades and parts are easy to replace. Stainless Steel lasts the life of the car. It *sells* in a new car and it *re-sells* in a used car.

**McLOUTH STEEL CORPORATION, Detroit, Michigan, Manufacturers of Stainless and Carbon Steels**



#### MAGNET MOCKS MIGHTY MUSCLEMAN!

This rugged weight lifter is certainly no "97 lb. weakling" but no matter how he grunts and groans he'll never be able to lift this weight. It's held in place by an Eriez HI-POWR permanent magnet bolted to the floor. (The weight was finally broken from the magnet's attraction by two strong men using hardwood pry-bars). This idea of herculean power now offers the metalworking industry many new ideas for automatic control and conveying of steel. Eriez permanent magnets to separate, retrieve and purify have also been used to solve hundreds of other production problems.

## Magnetic ideas from

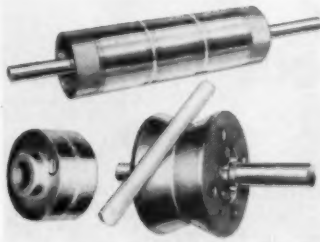


# ERIEZ



#### ERIEZ PERMANENT MAGNETIC PIPELINE FERROTRAPS

Most efficient magnetic separators for removing unwanted iron from most anything that flows through a pipeline! Two styles, depending on diameter of pipe or special need. Either type is quickly installed, easily cleaned by merely removing the magnetic element. Three to four times more magnetic area than old-style pipeline separators. Withstand high pressures. Ideal units for removing large iron contamination and microscopic fines from coolant lines, circulating oil systems, etc.



#### ERIEZ MAGNETIC ROLLS

Small-diameter, flat-faced; V-type pipe control. Installed singly or in groups, flat-faced permanent magnetic rolls are extremely useful for automatic feeding, conveying and spot control of sheets. Eliminate drifting, cobbles, untrue cuts . . . reduce downtime and rejects. Provide absolute control during baking, painting, trimming, etc. Easily installed on present systems. Eriez V-type rolls control and convey pipe from one location to another at capacity speeds, horizontally, vertically or up inclines. Positive hold prevents rebound, assures control during many operations. Decrease take-away time, provide shorter conveyor lines, eliminate direct drive rolls and motors.

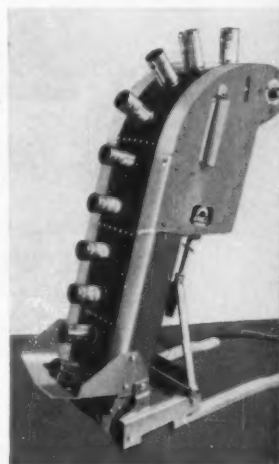
## Important metalworking news!

**How you can hold . . . control . . . and convey with Eriez Permanent Magnets!**

An entirely new concept in conveying and controlling metals and metallic parts is made possible by the introduction of Eriez Permanent Magnets to the metalworking field. Used for years as magnetic separators in varied industries, these lifetime-powered magnets offer many new ideas for automation. Eriez HI-POWR magnets are so strong they can bring moving metal to a dead stop. And they convey pipe, tubes, sheets, conduits, etc., at high speeds to maintain peak production. Pickup is faster, and there's less product damage caused by slippage and sag. Less conveyor space is needed (Eriez Magnets convey horizontally, vertically and up steep inclines). And no electric motors are required; you get years of trouble-free service with no power consumption. All Eriez Magnets are non-electric, self-contained. They have no wires or attachments. Powerful Alnico V magnetic elements are guaranteed indefinitely. There is no operating cost; first cost is the only cost.

#### ERIEZ MAGNA-MOVER (MAGNETIC CONVEYOR-ELEVATOR)

For automatic handling of such ferrous items as nails, bolts, cans, blanks, scrap, finished parts, etc. Moves materials at speed of 85 FPM, up inclines to 90°. Needs only 18½" x 37" floor space; fork-like legs (1½" high) fit under tables, machines, etc. Gently curved radius permits handling of relatively large objects. Lowers production costs; increases output. Hopper prevents loss of small parts being fed to the conveyor. Extended transition section for easy discharge into bins, pallets or other machinery. Also available: Magna-Rail — easily installed on existing lines directly under belt to convert ordinary belt conveyors into magnetic conveyor-elevators for all metal parts.



#### New! Eriez HI-VI Vibratory Equipment

First complete line of electro-permanent magnetic equipment operating at 3600 CPM directly off an AC line. No rectifier needed! . . . just plug in. Greater vibratory output with less power consumption. Less maintenance; lower installation costs. Lifetime-guaranteed Alnico V magnetic element (heart of the unit) produces an exclusive "double action" drive for more productivity.

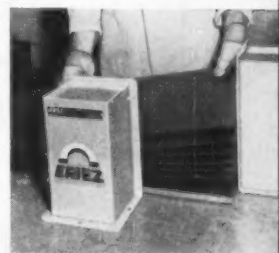


Write for complete information on HI-VI Unit (bin) Vibrators to keep bulk materials flowing freely. HI-VI Vibratory Feeders for accurate, controlled feed.



#### ERIEZ SHEET FANNER MAGNETS

Here's the magnet to speed up sheet metal handling and increase production. Slow, costly hand separation is completely eliminated . . . no more double feeding, no scratched surfaces, no cut fingers. An Eriez Sheet Fanner Magnet placed next to a pile of sheet metal automatically lifts the top sheet into the air, allows fast, safe removal. When the top sheet is removed, the following one automatically rises. Ideal for irregular and odd-shaped sheets. Available in five strengths.

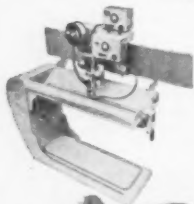
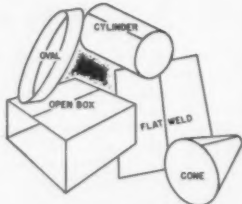


Eriez factory-trained field men, backed by extensive laboratory and engineering know-how, will be happy to study your particular metal handling problem and offer helpful "Magnetic Ideas." Our representatives are always glad to work with your engineering department or consulting engineers on any problem, large or small. For additional information concerning magnetic problems in the metalworking industry, or for additional data concerning any of the products shown, write to Eriez Manufacturing Company, 100D Magnet Drive, Erie, Pa.

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These two fixtures can give you  
Accurate - Smooth - Pressure Tight  
FUSION BUTT WELDS

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You need these



**AIRLINE MODEL LW SERIES 1000**  
Longitudinal Welding Fixture

Manufactured in 2 ft. to 12 ft. lengths. "Toe touch" control permits controlling fingers from any position. Welds sheets, cones, cylinders, boxes, etc., from .010 to one inch thickness. Suitable for MIG, TIG, submerged-arc and hand welds. Available also as complete package.



**AIRLINE MODEL R 4000**  
Planishing Roll — 60 Inch Treat

High Roller Face Pressure. Cold works welds and adjacent areas, flattens and smooths fusion welds, increases mechanical properties, reduces grinding. Also flattens flash welds, mesh welds, resistance welds and elongates weld areas. Diameters 1 3/4 in. to 10 ft., and to 10 ft. lengths on large diameters.

WRITE TODAY FOR COMPLETE DATA AND SAMPLES  
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CF&I Industrial Wire Cloth can be supplied with the proper resistance to corrosion, abrasion and extreme temperatures needed for maximum trouble-free service on your jobs. That's because it comes in a wide variety of standard and special meshes and weaves . . . and can be fabricated from non-ferrous metals as well as carbon and alloy steels.

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## HOW TO GET MORE FOR YOUR HANDLING DOLLAR

Timed for the June 5-8 Materials Handling Institute Exhibition in Cleveland, the feature article of the MAY 24 issue of The IRON AGE will offer dollar-saving tips on: Selection of handling equipment; truck scheduling systems; leasing vs. buying industrial trucks; conveyor and industrial truck maintenance. To advertisers the issue offers an opportunity to tie in with a major IRON AGE editorial effort and the intense interest in the show. Closing date for proofs is May 4. For complete plates, MAY 11.

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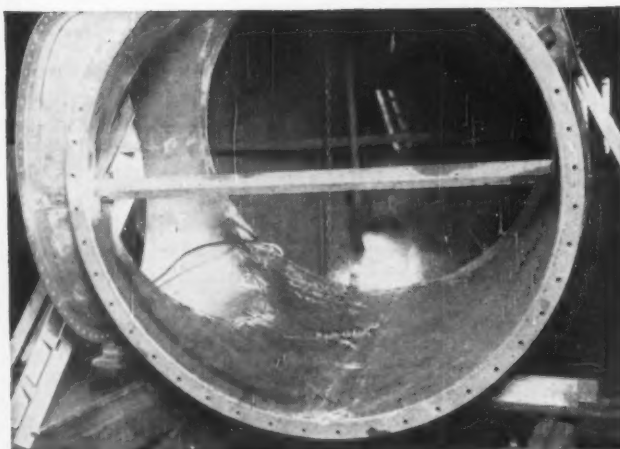
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- higher deposition rate . . . 10% to 30% faster arc speed
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*for all your welding needs*

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SERVICE-TESTED ®

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For All Types of Cars

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## THE CLEARING HOUSE

### News of Used and Rebuilt Machinery

**Profitless Prosperity . . .** In what one called a "profitless prosperity," Midwestern dealers are attempting to cope with a continuing rise in machine tool auction prices coupled with a credit shortage causing even larger corporations to extend payments by as much as 30 to 90 days.

Profitless or not, volume is extremely high in the Chicago area. Smaller shops that were still having difficulties in February are now out combing the woods for tools, and not having too much success. And as of last week, a number were reporting a still rising inquiry rate with requests coming from nearly all parts of the U. S.

**Demand . . .** Reconditioned and even "as is" tools seemed to be holding well. Rebuilt equipment demand is really up primarily for new high production plants going up in the area. In some cases, customer business has been at such strong levels that small rebuild shops have farmed out part of their work force on a contract basis to help customer maintenance forces keep up with the wear-and-tear on already purchased machine tools.

**Spare Parts . . .** While not approaching the Korean period in intensity the old spare parts problem has begun to plague used tool men. Some shops have been, as a matter of policy, making up in their own tool rooms, parts that cannot be quickly obtained from regular suppliers. During Korean conflict it was necessary to order some parts air freight. While most agree things aren't as bad as then, many are sure the present situation suggests delivery troubles ahead.

**All . . .** Demand is for the entire list from planers and radial drills through engine lathes, press brakes and shears, as well as rolling mill equipment. In some instances, the cutback of Westinghouse electrical equipment avail-

ability has aggravated a condition, which couldn't stand much aggravation.

**Crystal Ball Department . . .** Few of the smaller shops, generally the first to spot a letoff in customer ordering, are talking about hammering out sales at the March rate, or pretty close to it, all the way through second half. This assumes, of course, the normal seasonal drop in July and August, when used tool sales, as with most metalworking items, are effected by plant vacation periods.

April has been regarded by many as the critical month, one that would probably see low activity in the used tool business. However, some shops are doing as much as 30 pct or even 40 pct more business on a unit volume basis than they were last year at this time.

**Entire Picture . . .** Difficulty in obtaining spare parts is only a small part of the entire used tool picture. Most dealers will admit that they are low on floor stocks of used tools and aren't going to have an easy time getting more. It's been reported in the East that a rise in auction volume has increased the availability of tools. It's true that in the Midwest the volume of auction sales seems to be up, but at the same time auction prices have gone right up along with volume. And total turnover has increased just as rapidly as have auction sales.

**Extension . . .** New Northwest Highway has forced the moving of a number of small metalworking firms, but most of this equipment, when put on the block, has been auctioned off immediately without making a dent in demand. Adding to a strong local picture, a new parcel of requests for defense plant tooling has come in from the West Coast in recent weeks, strengthening an already strong demand from that area. Movement to the East also continues.

# CONSIDER GOOD USED EQUIPMENT FIRST

## BENDING ROLLS

6" x 1/2" Kiling Pyramid Type  
6" x 1/2" Niles Initial Type  
14" x 3/16" Hilles & Jones Pyramid Type  
12" x 3/16" Cleveland Pyramid Type  
16" x 1/2" Niles Pyramid Type  
20" x 1/2" Hensch Pyramid Type  
24" x 1/2" Hilles & Jones Pyramid Type  
27" x 1" Southwark Pyramid Type

## BRAKES—LEAF TYPE

12" x 3/8" Drels & Krump  
12" x 3/8" Drels & Krump, Motor Driven

## BRAKES—PRESS TYPE

12" x 3/16" Cincinnati  
14" x 3/8" Cincinnati Series 120-14

## BULLDOZERS

#3 Williams & White, 20" Stroke, 11 1/2" x 63" Face of Crosshead  
#27 Williams & White, 22" Stroke, 16" x 80" Face of Crosshead

## CRANES—OVERHEAD ELECTRIC TRAVELING

5 ton P&H 22" Span 230 Volt D.C.  
5 ton P&H 30" Span 220/3/60 A.C.  
10 ton Cleveland 96" Span 230 Volt D.C.  
10 ton Milwaukee 80" Span 230 Volt D.C.  
10 ton P&H 96" Span 220 Volt D.C.  
120 ton Whiting 80" Span 220/3/60 A.C.

## CUT OFF MACHINE

Yoder AD-2 Cut-off, Max. Capacity 3/4" O.D.

## DUPPLICATOR

Type BG-3 10" x 14 1/2" Pratt & Whitney Keller Automatic Dupplicator

## FORGING MACHINE

1" to 5" Acme, Ajax, National

## FURNACE

300 KVA Allis Chalmers Induction Melting Furnace Mercury Arc Converter

## HAMMERS BOARD DROP—STEAM DROP

STEAM FORGING—800 lb. to 20,000 lb.

## HAMMERS—MISC.

#235 Lobdell Nazel, Capacity 4" Square

2000 lb. Chambersburg Coco-Drop

## LEVELERS—ROLLER

60" United 17 Rolls 3 1/2" Dia.

70" McKay 17 Rolls 3 1/2" Dia.

## MULTI SLIDE MACHINE

No. 33 U. S. Multi Slide Machine with Edgewise

Stock Straightener

## PRESS—GAP FRAME

125 ton Heat-Treated Open Back Gap Press, Stroke

1 1/2", Bed Area 28 1/2" x 16 1/2" (New)

## PRESSES—HYDRAULIC

530 ton Baldwin Southwark 12" Stroke 48" x 25"

Between Columns

1500 ton 4-Col. 24" Stroke, 40" Bet. Columns

1257 ton Baldwin Southwark Forging Press, 30"

Stroke Main Ram, 54" x 41" Bet. Columns

1500 ton B-L-H Hydr. Forging Press

## PRESSES—STRAIGHT SIDE

60D-84 Cleveland Double Crank 14" Stroke Bed

Area 48" x 84"

2 1/2" HP Zeh & Hahnemann Percussion Press 75 ton

Clearing Model TP41500-200 Triple Acting Strokes

40, 32, 14" Bed Area 100" x 200"

PUNCH & SHEAR COMBINATIONS

Style EP Cleveland 36" Throat, Punch 1 1/2" thru 1"

Style W Cleveland 60" Throat, 312 Ton

## ROLLING MILLS

10" x 16" Single Stand, Two High

12" x 16" Phila., Single Stand, Two High

12" x 20" Standard Single Stand, Two High

15" x 28" Farrel Single Stand, Two High

15" x 30" G & M Single Stand, Two High

10" x 24" Farrel Two Stand, Two High

22" x 12" x 40" Lewis 3-High Sheet Mill

12" Three High Bar Mill

26" x 34" United Single Stand, Two High

## ROLLS—FORMING

# Torronator Ring Type Reversing Mill

For cold reducing 7" wide strip

8 Stand Rafter Tube Forming Machine, Spindle 1 1/2"

## SHEAR—BILLET

No. 7 Hilles & Jones, Motor Drive, Cap. 3" Sq.

## SHEARS—GATE

80" x 1/2" Pels

80" x 1" Hilles & Jones

## SHEAR—ANGLE

6 x 6 x 3/4" Cleveland

## SHEARS—SQUARING

12" x 3/16" Cincinnati #1412

12" x 3/8" Niagara, NEW 1951

12" x 3/4" Steelwell

## SLITTERS

38" Yoder Slitting Line

G-48 Yoder Gang Slitter, 5" Threaded Arbor

## STRAIGHTENERS

Kane & Rutch 2 Roll Rotary Straightener, M.D.

Capacity Mildsteel 1/4" to 3/4"

36" Hallden Strip Straightener & Cut-Off

Actus Standard 12 Roll Straightener, Capacity 2 1/2"

5/16" Shuster Rotary Straightener & Cut-Off

## TESTING MACHINES

60,000, 100,000, 200,000 Olsen & Riehle Universal

50,000 and 300,000 lb. Compression

## TUBE MILL

Etna Welded Tube Mill 1 1/4", With Cut-Off & Welding

## WIRE DRAWING MACHINE

Synco BCS 14 Die Wire Drawing Machine with

Spooler & Blocks, Entering Size Max. .105", Finish

Min. .0104" low carbon steel

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## REBUILT — GUARANTEED ELECTRICAL EQUIPMENT

### DIRECT CURRENT MOTORS

Qu.	H.P.	Make	Type	Volts	R.P.M.
2	3000	Wbas.	Mull	525	600
6	1500	Wbas.	Mull	525	600
1	1250	G.E.	MCP	600	505/790
4	800	Wbas.	Encl.	525	600
1	700	Wbas.	Mull	230	300/700
2	600	Al. Ch.	Mull	400	300/600
2	500	Wbas.	Mull	230	285/710
1	450/250	Al. Ch.	Mull	375/250	1500/1000
1	450	Wbas.	SK	230	450/600
1	350	G.E.	CD-160	230	1150
1	200/250	El. Dy.	SK-219	230	490/1200
1	200	Wbas.	SK-219	230	490/1200
1	180	G.E.	MPC	230	400
1	150	Wbas.	SK-201	230	380/900
2	125	Wbas.	SK-184	230	375/850
1	125	G.E.	MPC	230	400/600
1	100	El. Dy.	SK-8	230	450/1350
8	100	El. Dy.	SK-8	230	475/950
1	80	Reliance	SK-131.5	230	575/1150
3	50	Wbas.	SK-131.5	230	600/2200
1	40	G.E.	CD-123	230	500/1000
1	40	Wbas.	SK-140	230	500/1700
1	32 1/2	Wbas.	SK-150	230	400/1200
2	25	Wbas.	SK-83	230	1800
1	20	Cr. Wh.	D.P.B.B.	230	1150/2400
1	20	Wbas.	SK-123	230	400/1200
1	15	CD-85	230	575/2300	
3	15	Wbas.	SK-100L	230	500/1500
1	15	Reliance	155-T	230	400/1600
1	10	Wbas.	SK-103	230	400/1600
1	10	Al. Ch.	E-122	230	300/1200
4	10	Wbas.	SK-81	230	350/1000
1	7 1/2	G.E.	CD-75	230	890/2070
1	7 1/2	G.E.	CD-85	230	450/1350
4	5 7/8	Reliance	T.E.F.O.	230	537/1350

### MOTOR GENERATOR SETS

Qu.	KW	Make	D.C. Volts	A.C. Volts
1	2500	Wbas.	720	600 4160/2300
2	1250	Wbas.	720	600 2300
1	500	Cr. Wh.	720	800 2300/440
1	500	Wbas.	1200	125/250 2300/440
1	400	Cr. Wh.	1200	250 2300
1	300	G.E.	1200	250 2300
3	200	G.E.	900	125/250 2300
6	150	G.E.	1200	250 2300
1	100	Wbas.	900	250 2300
1	100	Cr. Wh.	1200	125 440/220
1	75	G.E.	1200	250 440/220
3	50	G.E.	1200	250 440/220

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Cable Address: "Macsteel" Philadelphia, Pa. Phone: Davenport 4-8300

#1 & #2 Buffalo Forge Vertical Bending Rolls. Leg-in Attachment. Late Type.  
#1/2 & #1 1/2 Buffalo Universal Ironworker. Coper, Notcher. Late Type.

## FALK MACHINERY COMPANY

16 Ward St. Baker 5887 Rochester 5, N. Y.

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### GRINDING MACHINES

72" Hanchett 3-spd. rotary surface, new 1946.

13" x 60" Model 300 Hanchett vert. spdl. late.

14" x 36" Pratt & Whitney hyd. vert. surface, 1942.

30" No. 18 Blanchard rotary surface, new 1941.

No. 72A5 Heald hyd. pl. internal, extended bridge, 1943.

No. 74 Heald hyd. pl. internal, X-sliding H.S., 1941.

No. 72A3 Heald hyd. pl. internal, X-sliding H.S., 1941.

12" x 24" Cincinnati ER hyd. universal cyl., 1943.

2U3B1H-5

14" x 36" Landis type C hyd. pl. cylindrical, 1942.

8" x 30" Cincinnati EA Fimatic pl. cylindrical, 1942.

### HAMMERS

No. 6-1 Nazel, pneumatic, late

No. 5N Nazel, self-contained.

No. 6B Nazel, self-contained.

### LATHES

24" x 8" LeBlond H. D. engine lathe.

14" x 6" Hendey Toolroom, 1940.

15" x 30" Lipe Carbo-Matic, 1942.

30" x 156" centers Monarch NN engine lathe, new 1942.

126" x 96" CC Niles Bement Pond engine lathe, 80HP

M.D.

90" swing Betts Bridgeport H.D. engine lathe, late.

### PLANERS

36" Rockford Hyd. Openside Shaper-Planer.

36" x 60" Rockford H.D. openside hyd. planer, ser.

OG-7510

42" x 42" x 12" Liberty dbl. housing planer, 35 HP

M.D.

48" x 48" x 10" Gray Maxi-Service.

### PRESSES

90 ton No. 92 1/2 C Toledo D.C. Str. Side.

250 ton No. 78 1/2-72 Toledo D.C. Toggle drawing.

500 ton No. 1039 Hamilton D.C. adj. bed, 60" x 102".

### SHAPERS

24" Gould & Eberhardt Universal.

32" G & E Invincible; F.M.D., late type.

### SHAPERS & SLOTTERS

36" Rockford openside hyd. shaper-planer, ser.

39WU35.

36" Rockford hyd. vertical slotter, new 1944.

### UPSETTERS

3 1/2" Ajax suspended slides, steel frame.

1 1/2" National Upsetter, guided ram, hard ways.

2" National Upsetter, guided ram, air clutch.

### 1000 Tools in Stock

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## MILES MACHINERY CO.

PHONE SAGINAW 7-3105

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## BENNETT MACHINERY CO.

### LARGE LATHE

1—126" Swing x 96" Between Centers Niles Bement Pond Heavy Duty Engine Lathe—90" over carr., 2 carr. each with 15 h.p. motor. Drive motor 80 h.p., bed in four sections.

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Surplus Mfg. Equipment Inventories Purchased

4" National Upsetter High Duty, guided over-arm slide, air clutch

Ajax & National Upsetters, suspended slide, 2 1/2", 3", 4", similar upsetters not suspended slide, 3/4", 1", 1 1/2", 2", 3"

5" Acme Upsetting & Forging Machine suspended slide, cam side die slide

700-ton Ajax High Speed Forging Press

50,000# Standard Double Draw Bench

#3 Abramson Bar & Tube Straightener

Pels FV-75 Bar & Biller Shear, Cap. 7 1/2" rd

10" x 1 1/2" Plate Shear, Long & Allstatter 10" throat, M.D. Rebuilt

10" x 1" Long & Allstatter Plate Shear

Hilles & Jones and Buffalo Shears 1 1/2", 2", 2 1/2", 3", 3 1/4", 4" and 4 1/4"

1600 & 2750# Chambersburg Model F Board Drop Hammers, Roller bearing; double V-ways, Built 1943

1500# Niles & 2500# Chambersburg Single Leg Steam Forging Hammers

# CALL Curry!

## FOR SURPLUS STEEL PLANT EQUIPMENT

1—12" Bar Mill—3 stands 3-Hi, complete with Pinion Stand, 750 H.P. DC motor and Controls, Bed Plate, etc. complete. Also available Vertical Pin Reel, Horizontal Pin Reel.

1—12" Bar Mill—7 Stands 3-Hi, complete with Pinion Stand, Gear Reducer, Bed Plate, etc.

1—18" 3-Hi Mill Stand, complete with Housing Fillings, Rolls, etc.

1—24" Bar Mill—3-stands 3-Hi, complete with Tables, Bloom Shear, Saw, Furnace and DC Drive.

1—80" Hot Strip Mill Stands. 3-Stands 4-Hi with Pinion Stands.

1—15" Hot Strip Mill. 8-Stands Continuous, 4-Stands Cross-Country. Complete with Furnaces, Drives, Hot Bed and Shears.

1—8" dia. x 8" body 2-Hi Cold Reduction Mill, complete with 50 H.P. DC Motor, Combination Pinion Stand and Drive.

1—1/2" x 96" Down Cut Plate Shearing Line, complete with two Shears, Roller Tables, Gauges, Piler, etc.

13/4" x 12" Morgan Plate Shear. 18" Gap. Complete with Holddown and 50 H.P. AC Motor.

1—25" Sheet Bar Shear. Complete with 30 H.P. Motor and driven Entry and Delivery Tables.

1—3/16" x 12" Stamco Power Squaring Shear. Complete with Holddown.

1—20,000# Farrel-Birmingham Drawbench. Single Chain Single Draw. 50 Ft. Length of Draw. Complete with 15 H.P. DC Motor.

Write for the Curry List of available steel plant equipment

**Curry & CO. INC.**

**STEEL PLANT EQUIPMENT**

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### RE-NU-BILT GUARANTEED ELECTRIC POWER EQUIPMENT D. C. MOTORS

Qu.	H.P.	Make	Type	Volts	RPM
1	2200	G.E.	MCP	600	400/300
1	1500	G.E.	MCP	600	650/800
1	1000	G.E.	MCP	600	350/700
1	940	Whae.	QM	250	140/170
1	800	Whae.		250	450/550
1	500	Whae.	CC-216	600	300/900
1	500	G.E.	MCP	250	250/750
3	450	Whae.		550	415
1	250	G.E.	MPC	250	400/600
1	200	G.E.	CD-1650Z	250	500/1500
1	200	Whae.	CB-5115	250	400/800
1	150	G.E.		600	250/750
1	150	Cr. Wh.	65H	250	1150
2	150	Cr. Wh.	83H-TBFC	250	800
1	150	Whae.	SK-151B	250	900/1800
1	150	Whae.	SK-201	250	360/950
1	120	G.E.	MCP	250	250/1000
1	125	Whae.	SK-183	250	850
8	100	Hel.	1050T	250	400/1200
2	100	Whae.	SK-181	250	450/1000
2	75	C.W.	53H-TBFC	250	800
1	50	G.E.	MD-412AE	250	550

### M-G Sets—3 Ph. 60 Cy.

Qu.	K.W.	Make	RPM	D.C. Volts	A.C. Volts
1	3000 (3U)	G.E.	514	600	4000/6900/13200
2	2000/2400	G.E.	450	250/300	2300/4600
1	1750/2100	G.E.	514	250/300	2300/4600
1	2000	G.E.	500	250g 660	2300/4600
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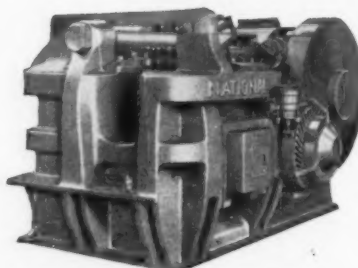
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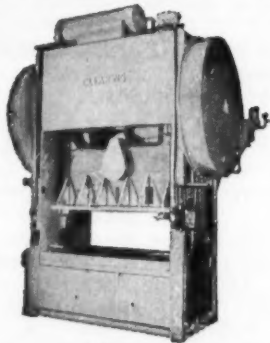
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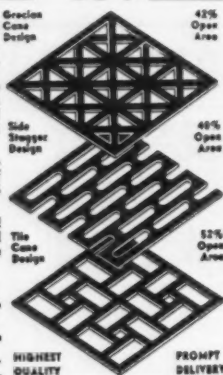
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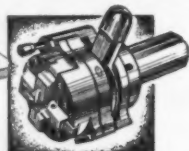
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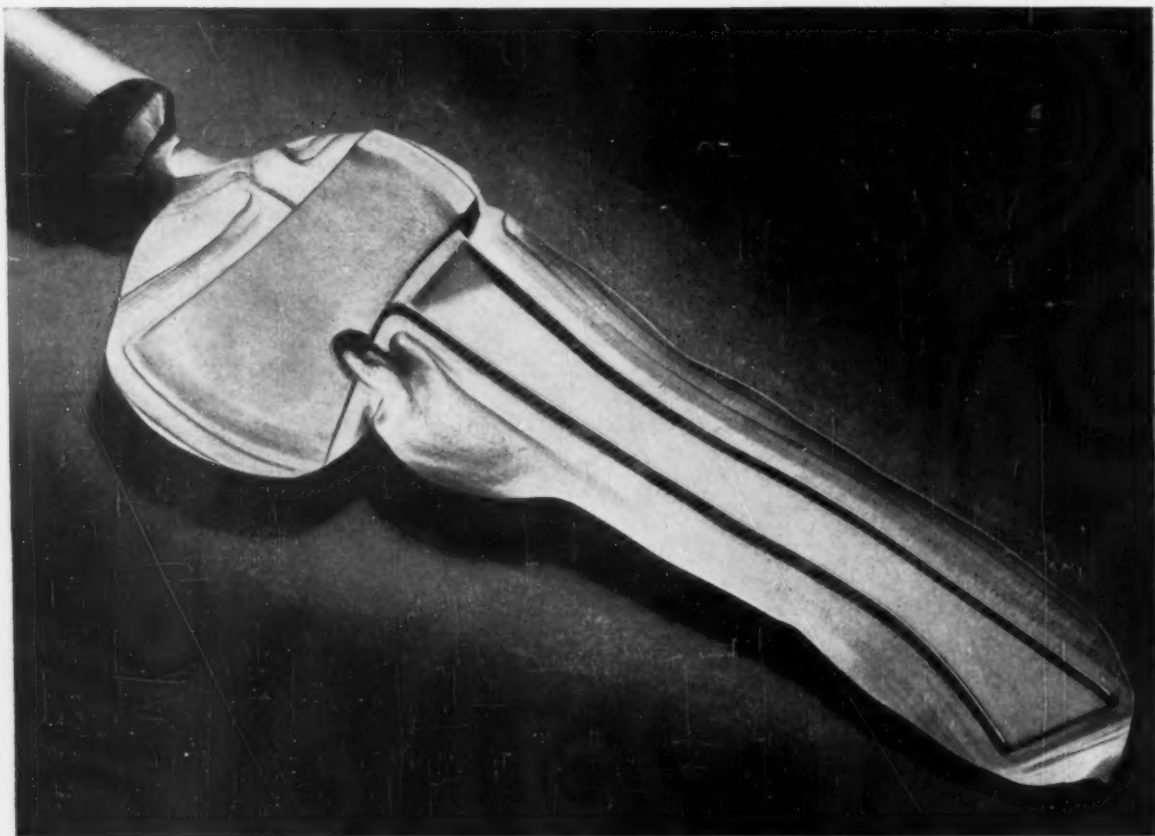
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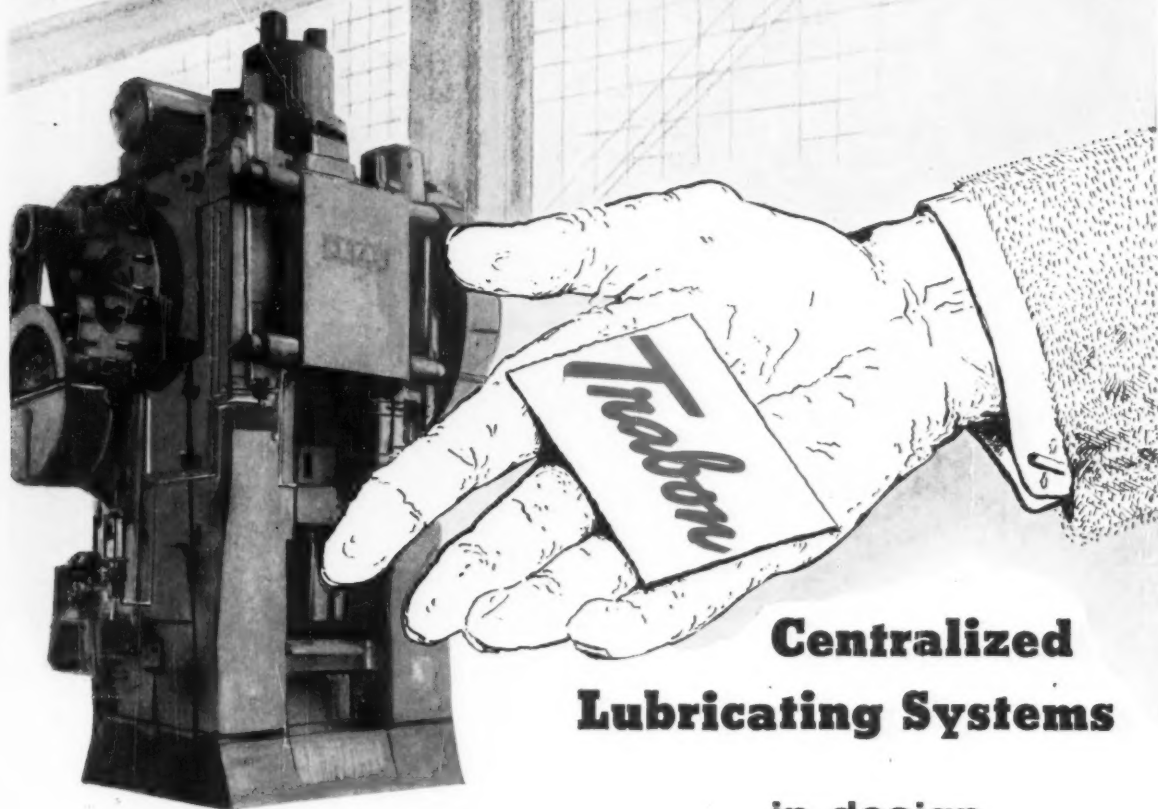
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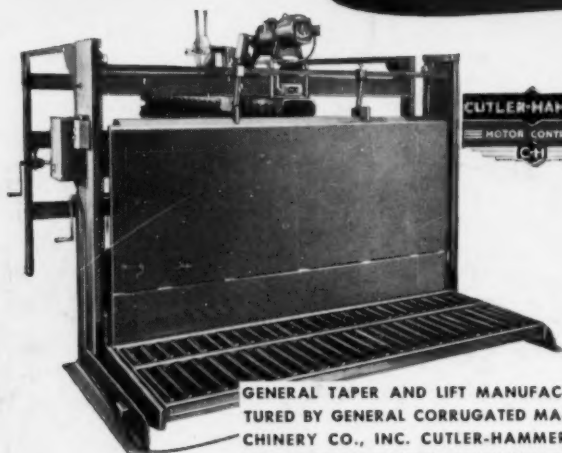
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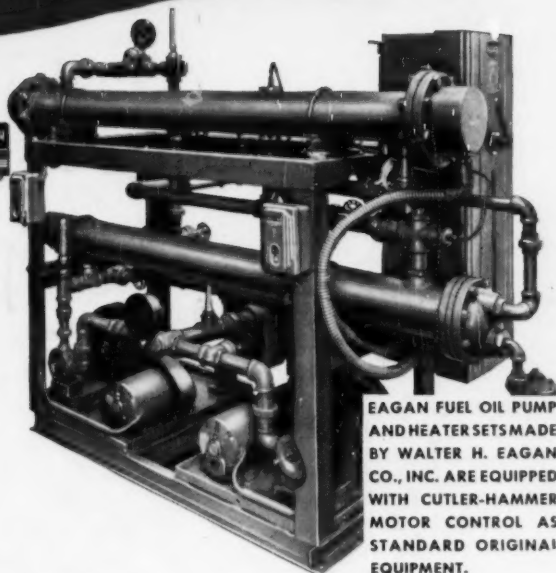
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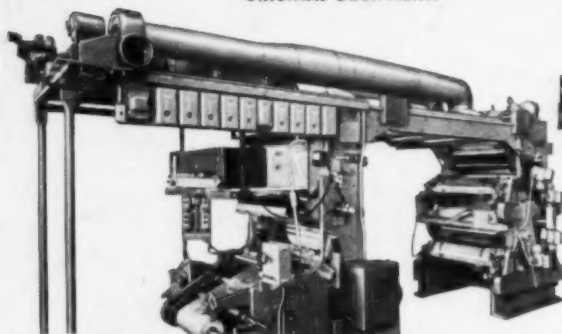
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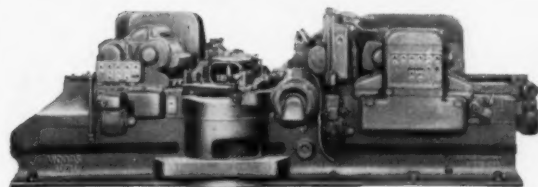
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